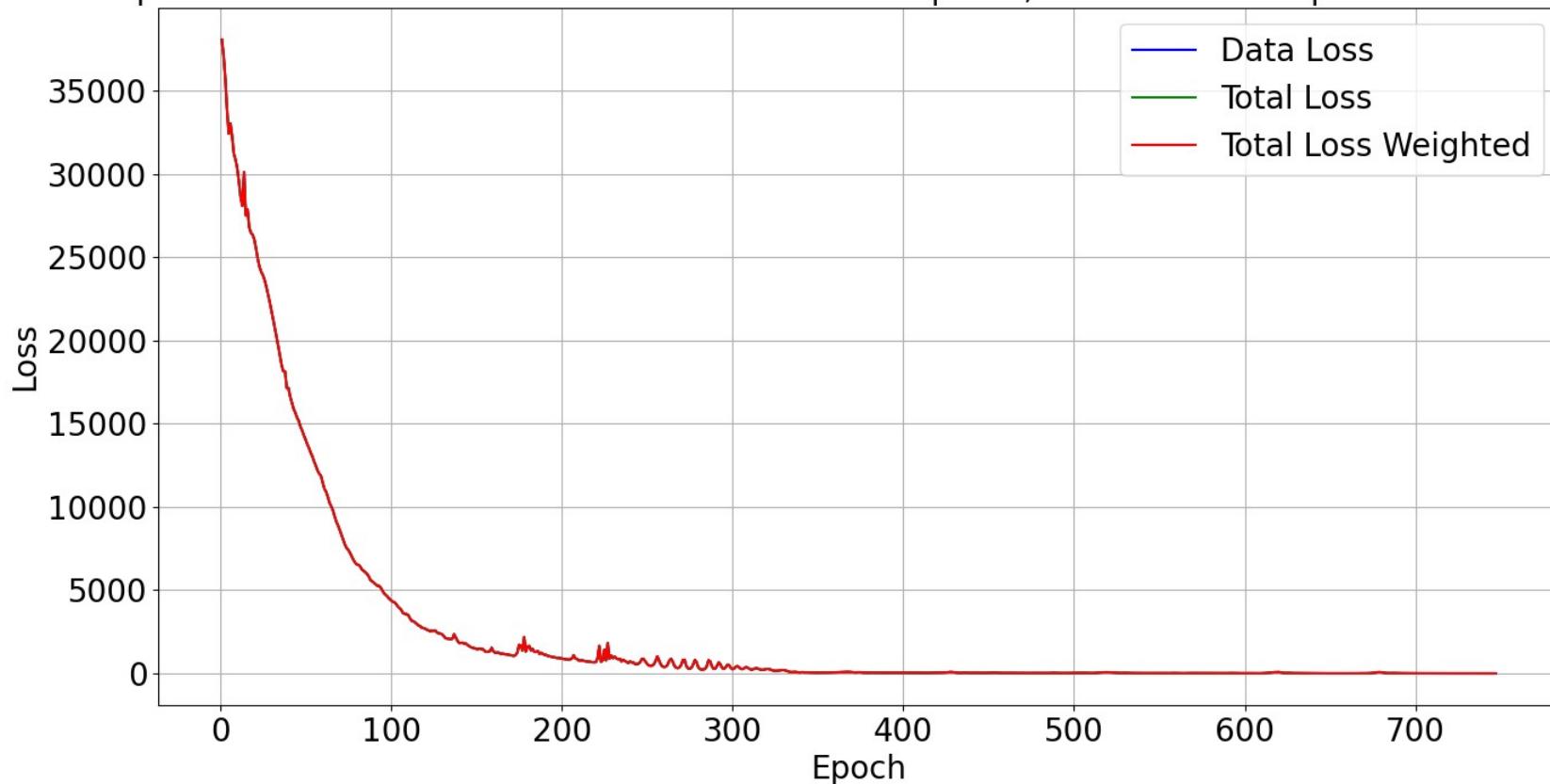


PM0XX – 12 MARCH 2024

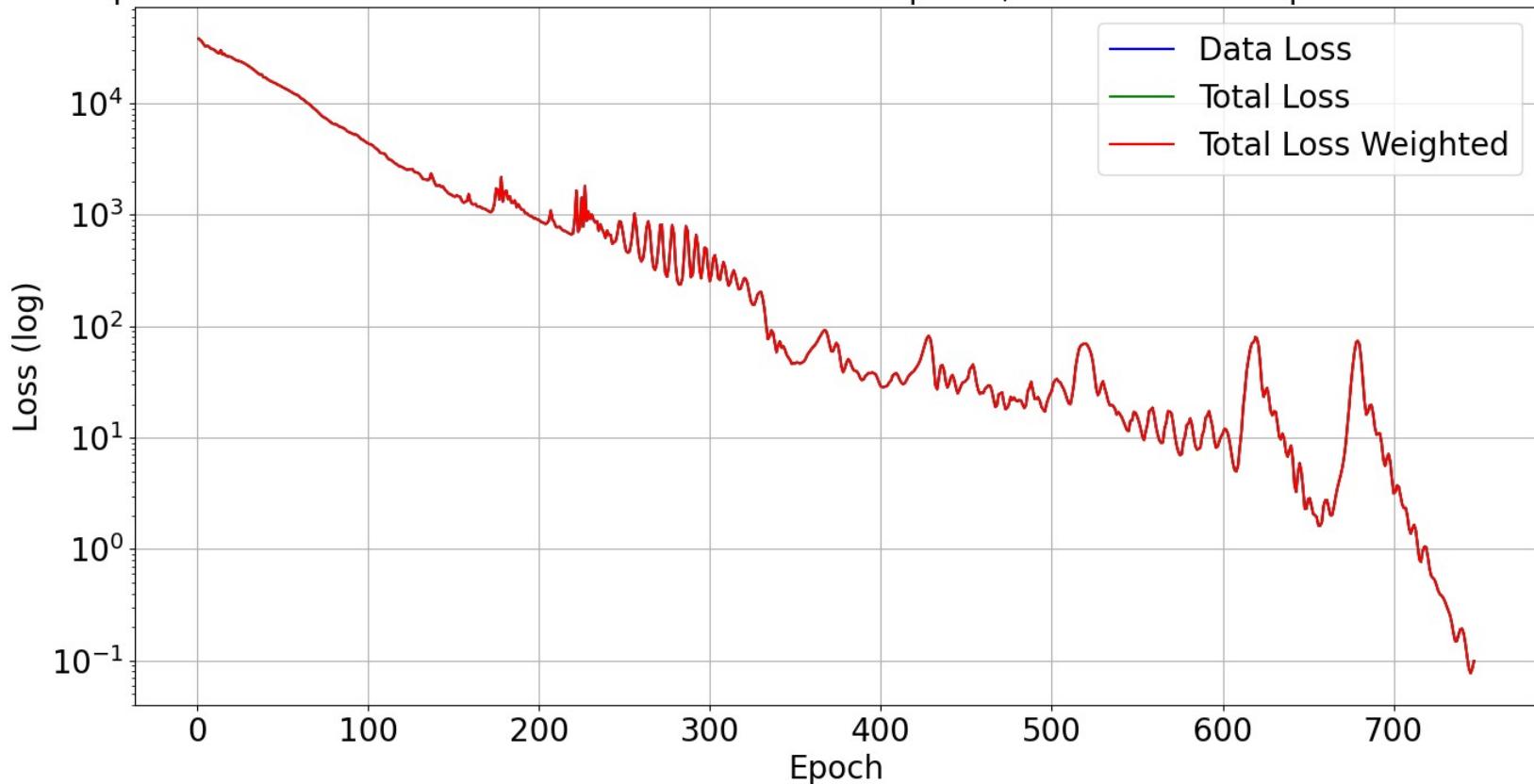
La Defense – Training with POD Data

Application to Urban Wind Field Dispersion Studies

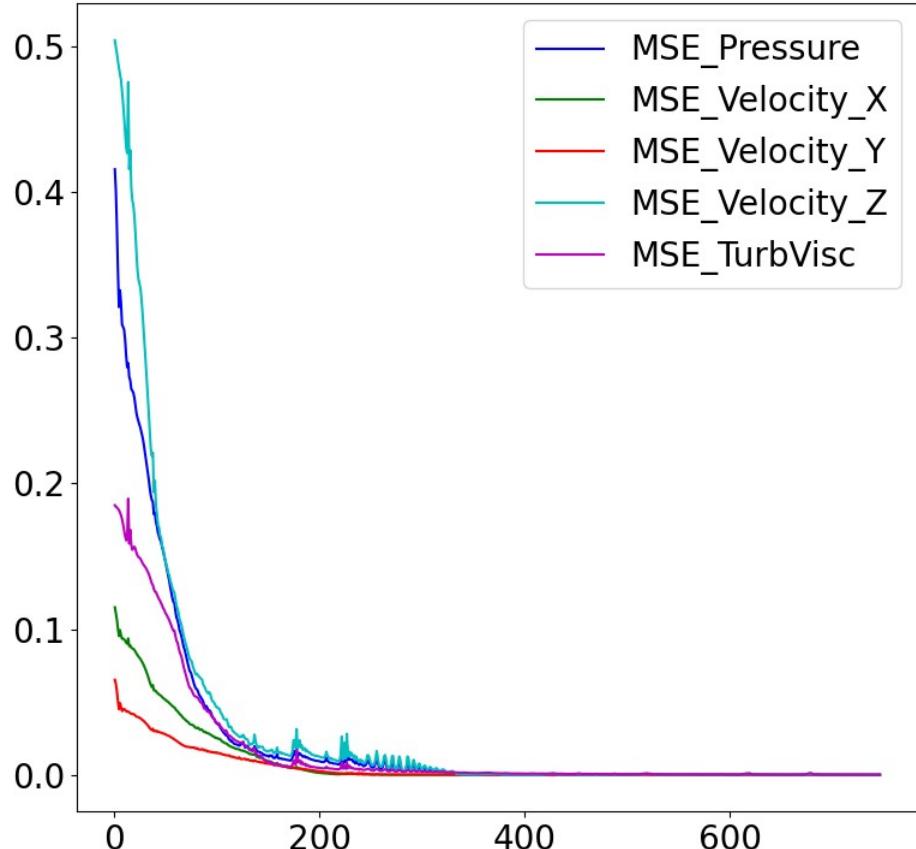
Epoch vs Loss - Time Taken = 21.48 hours for 747 Epochs; Time Taken Per Epoch = 0.03 hours



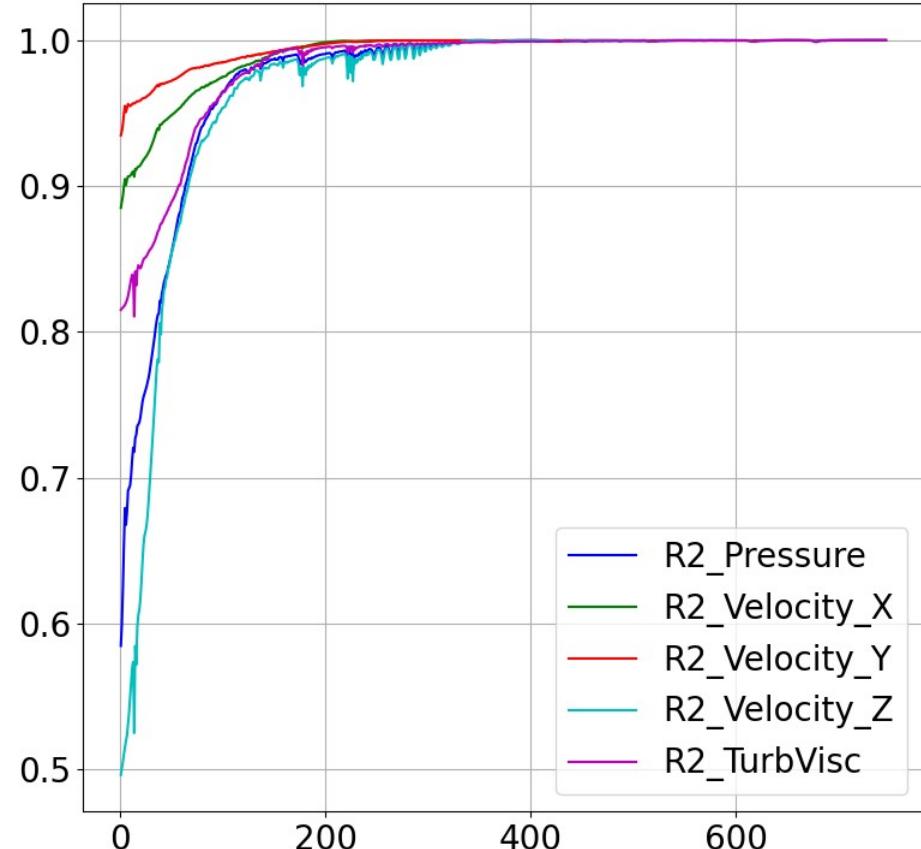
Epoch vs Loss - Time Taken = 21.48 hours for 747 Epochs; Time Taken Per Epoch = 0.03 hours



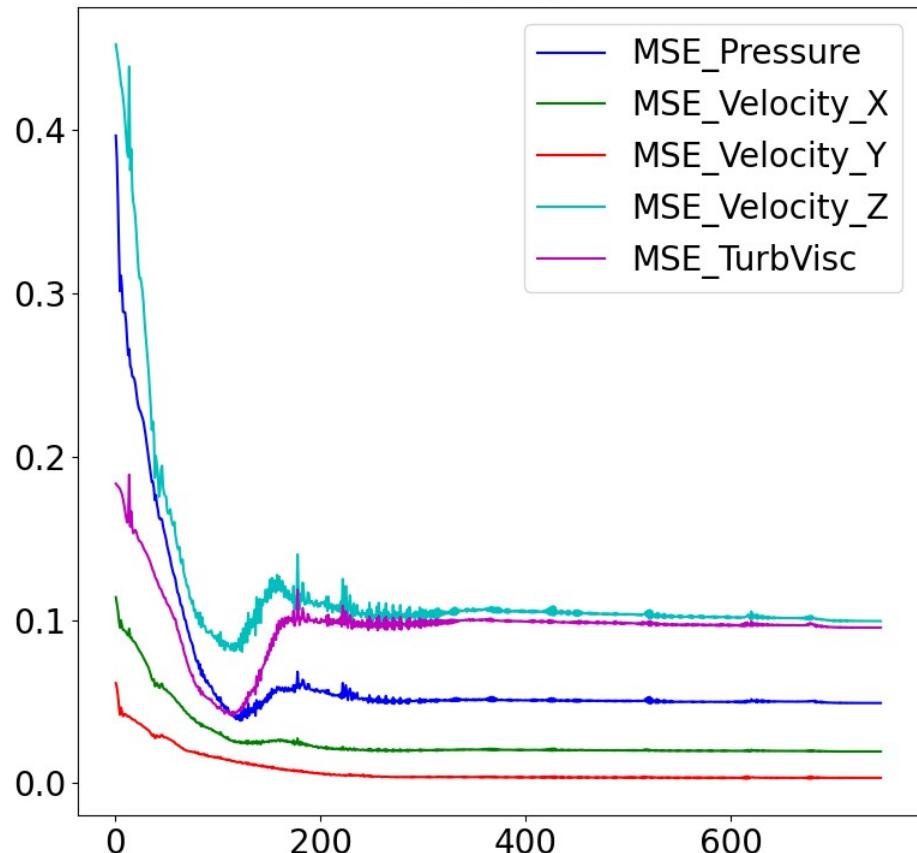
MSE Loss



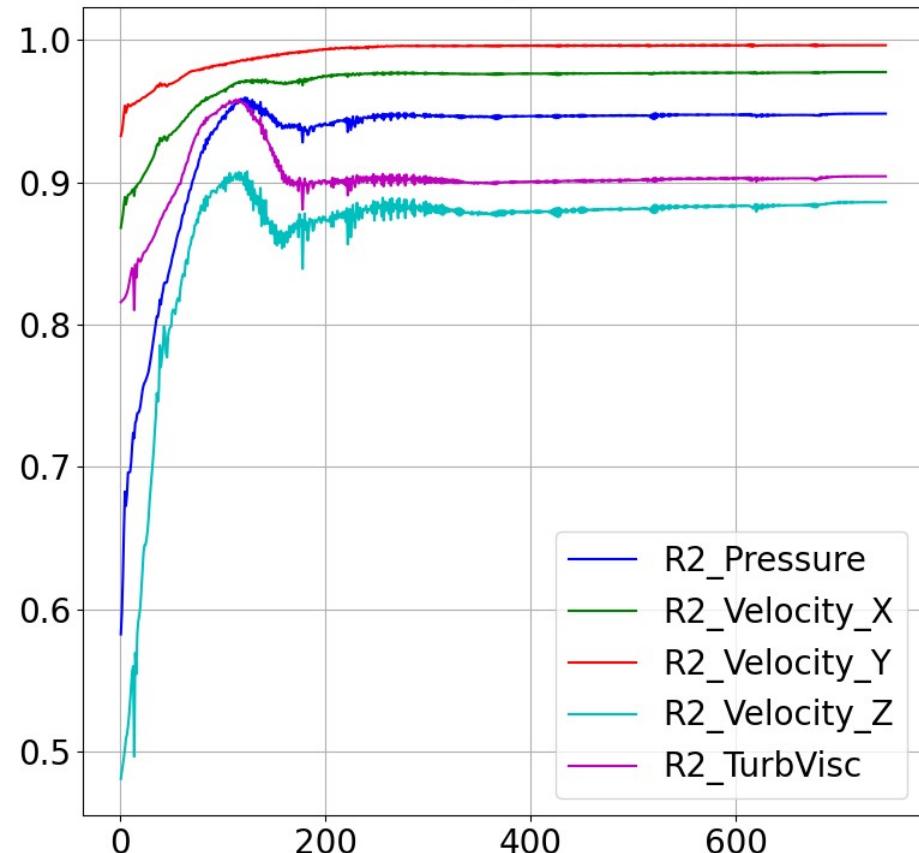
R2



MSE Loss



R2



Progress so far - Data Loss Only
Standard Normal Scalar – ELU Activation
(Adam Optimizer)

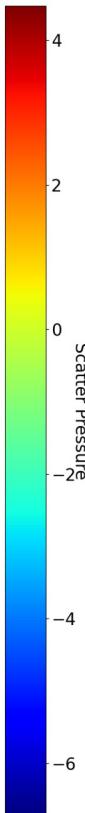
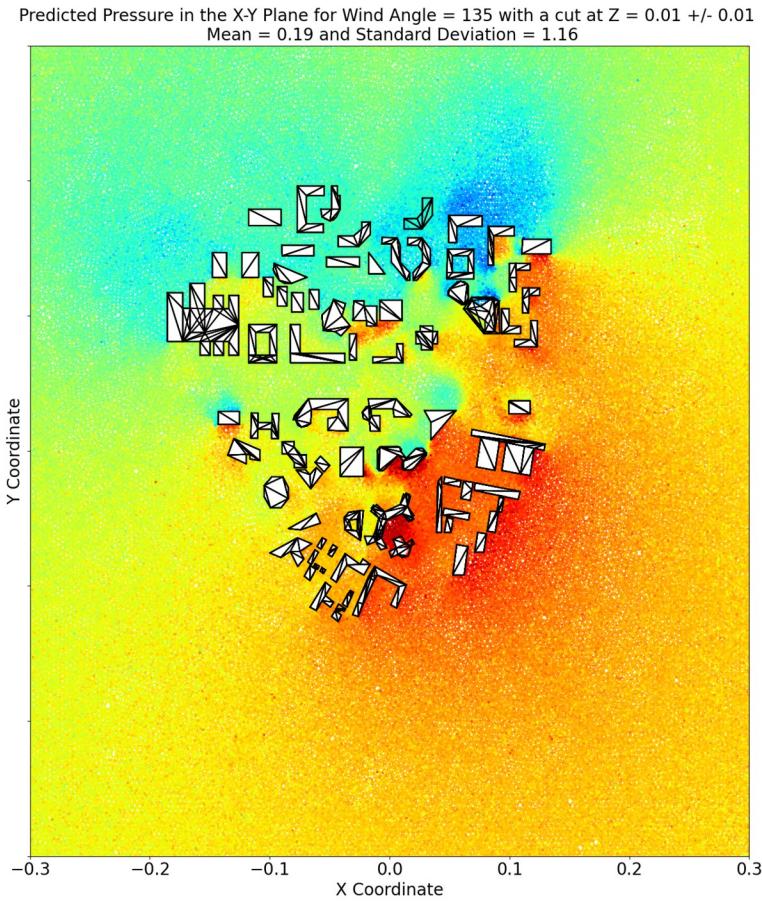
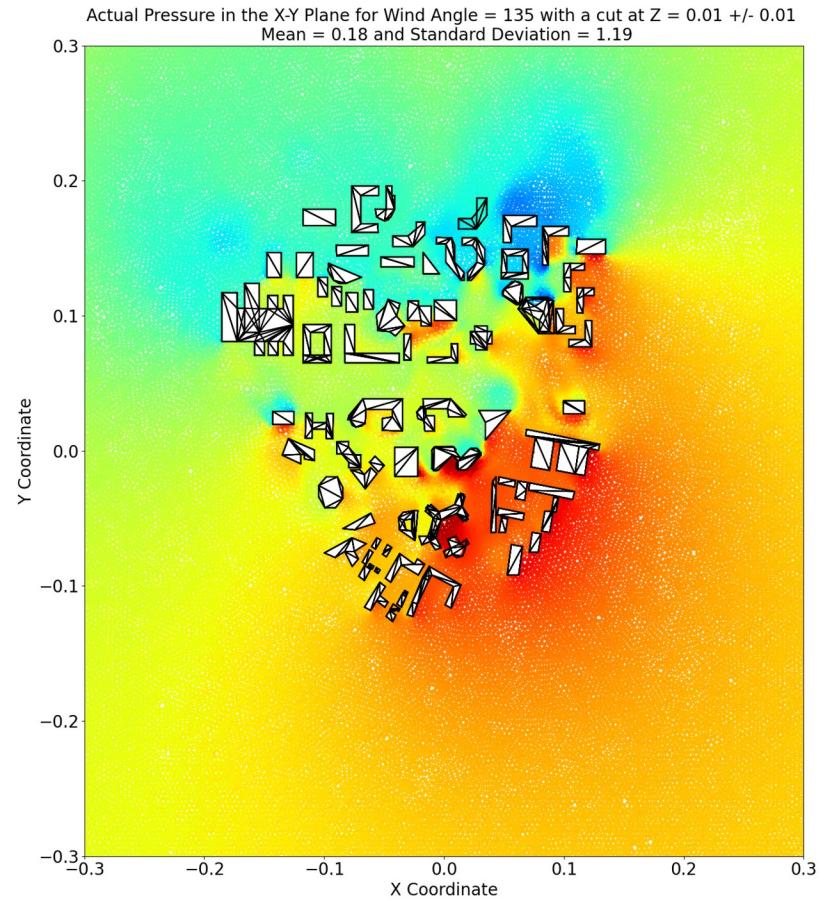
Threshold = SMA 1E-5 (702 Epochs, not completed), GPU Laptop

Scripts v5 – PREDICTING (Angle = 135)

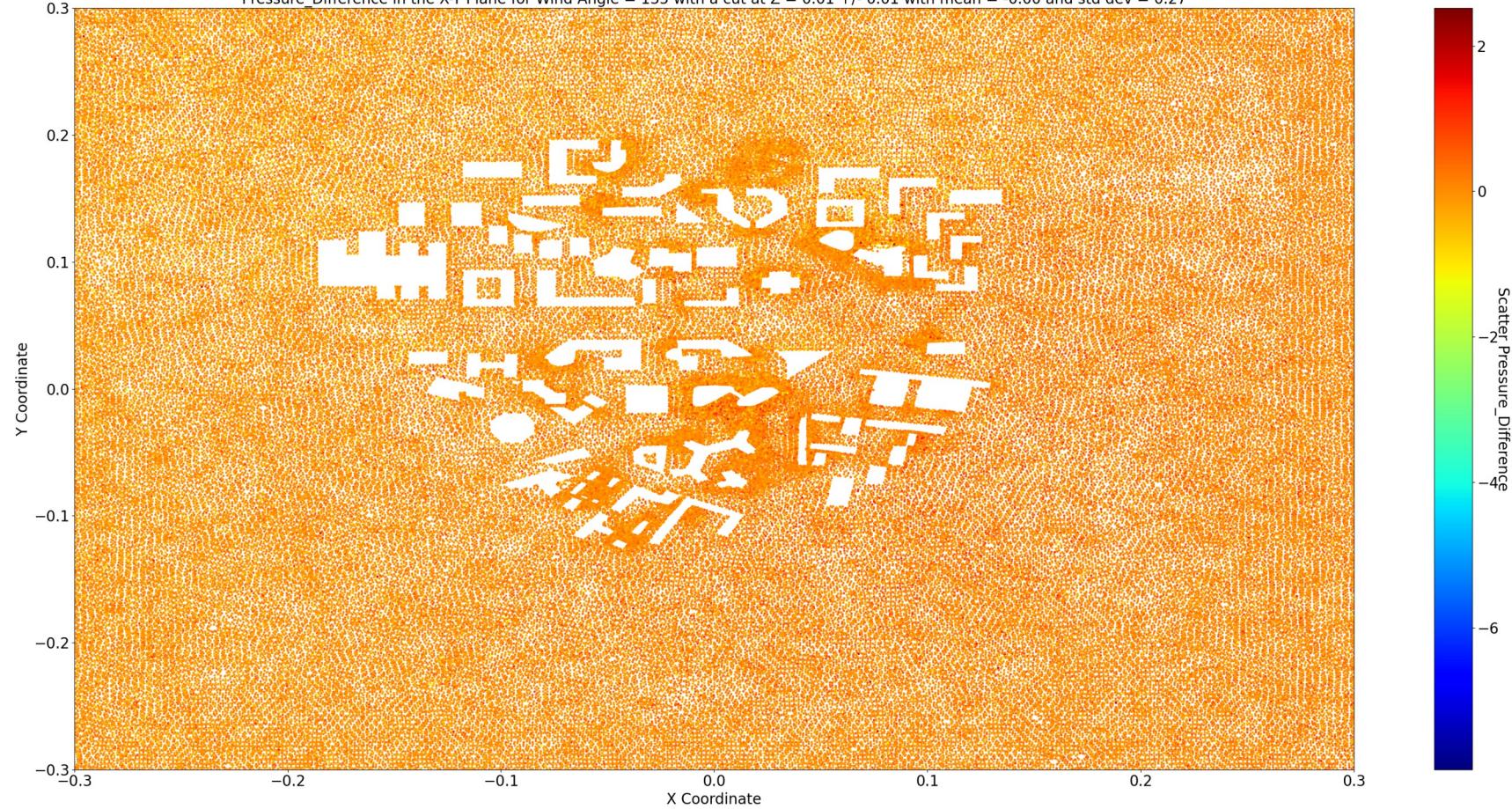
Progress so far - Data Loss Only, Standard Normal Scalar, ELU Activation, Adam Optimizer
Threshold = SMA 1E-5 (702 Epochs, not completed), GPU Laptop
Predicting Results – Metrics (Angle = 135)

Variable	MSE	RMSE	MAE	R2
Pressure	0.054504220147	0.233461388985	0.164721676947	0.952092976992
Velocity_Y	0.062525827804	0.250051650273	0.177290886127	0.923315698208
Velocity_Z	0.042406649383	0.205928748317	0.149107288552	0.970788412674
Velocity_Z	0.001771694627	0.042091503032	0.027816816141	0.896394252482
TurbVisc	21.73768056075	4.662368556941	3.180727812894	0.906866783082

Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Y Plane with a cut at Z = 0.01 +/- 0.01

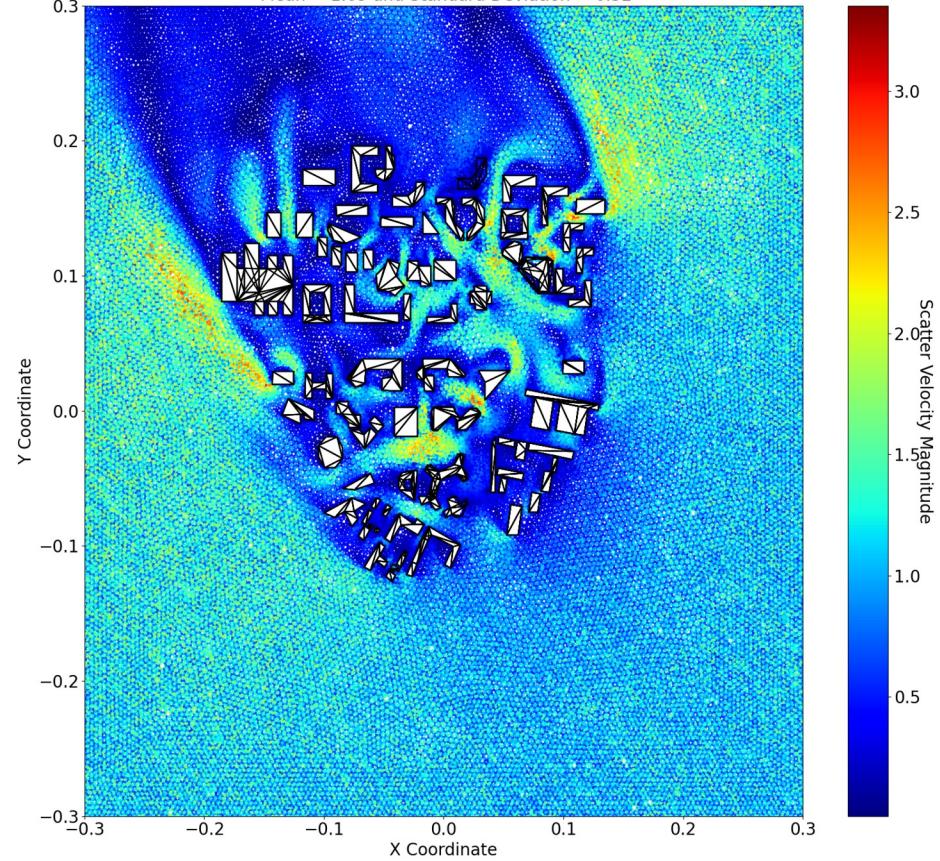


Pressure Difference in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01 with mean = -0.00 and std dev = 0.27

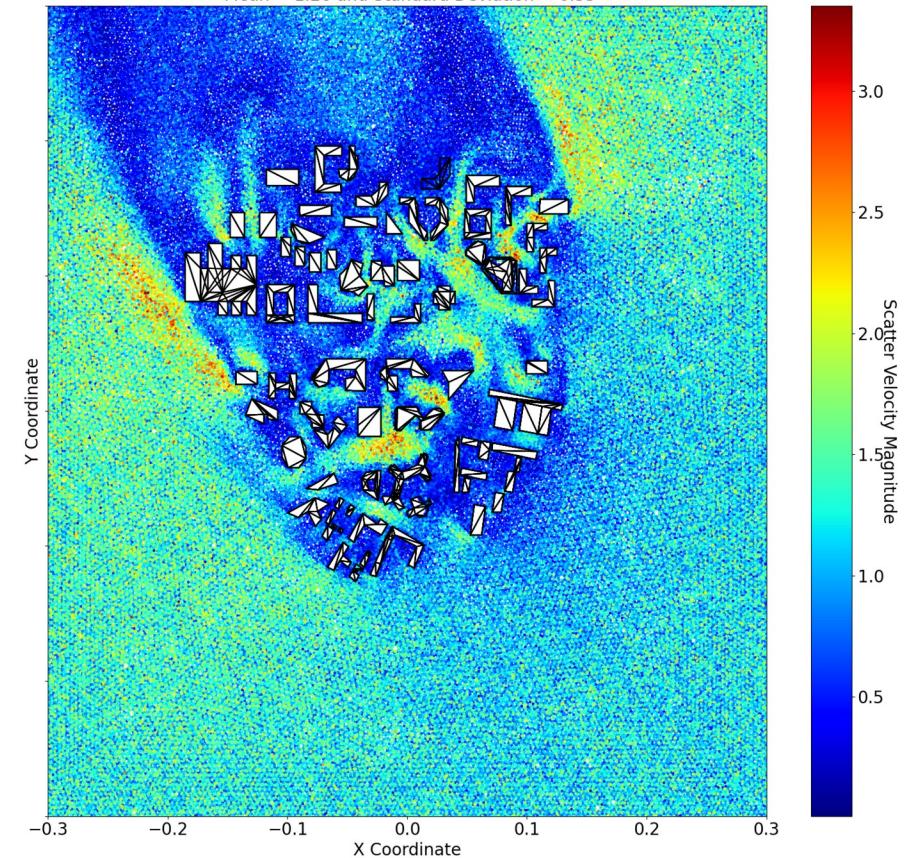


Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Y Plane with a cut at Z = 0.01 +/- 0.01

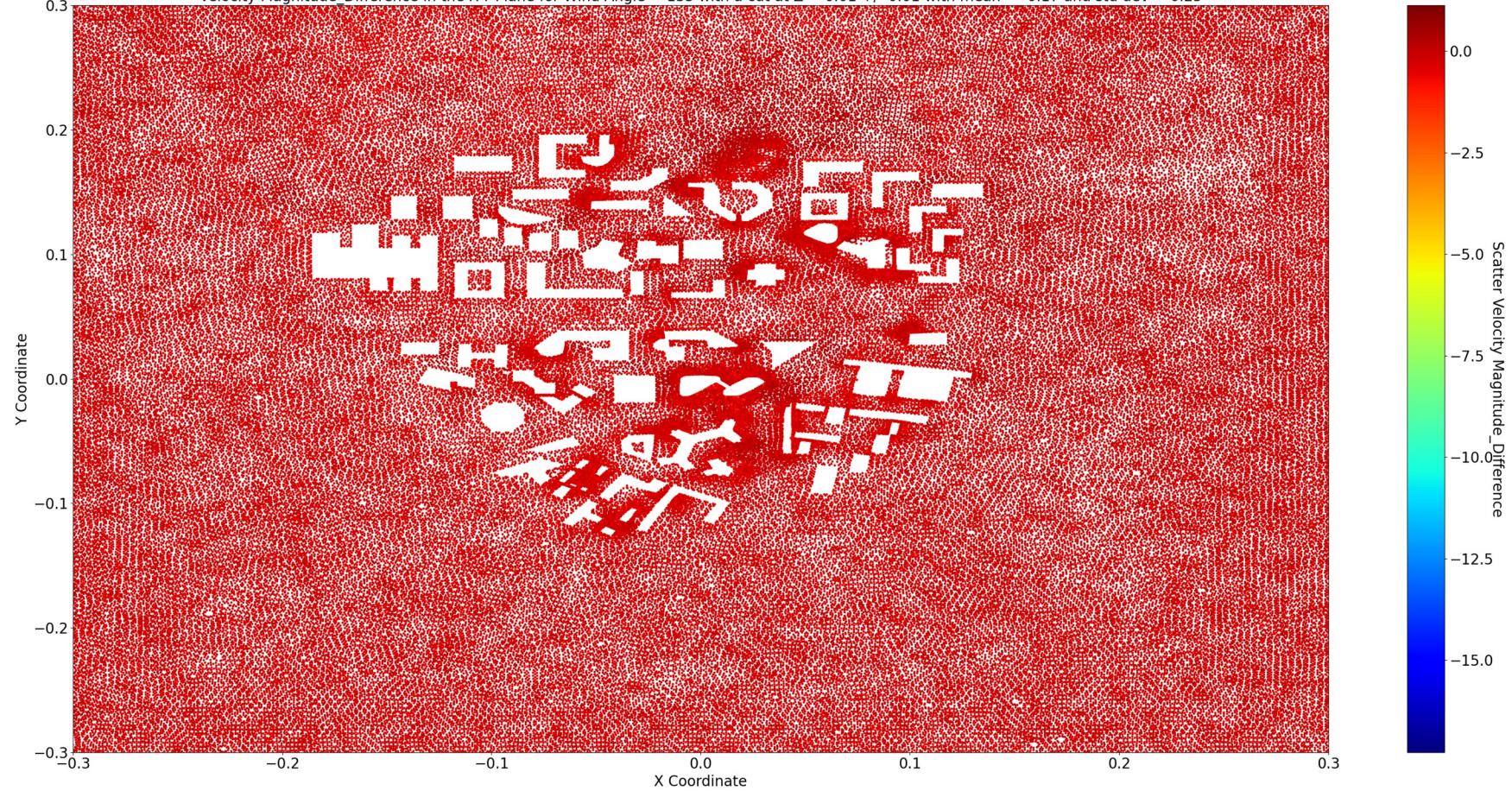
Actual Velocity Magnitude in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01
Mean = 1.09 and Standard Deviation = 0.52



Predicted Velocity Magnitude in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01
Mean = 1.26 and Standard Deviation = 0.55

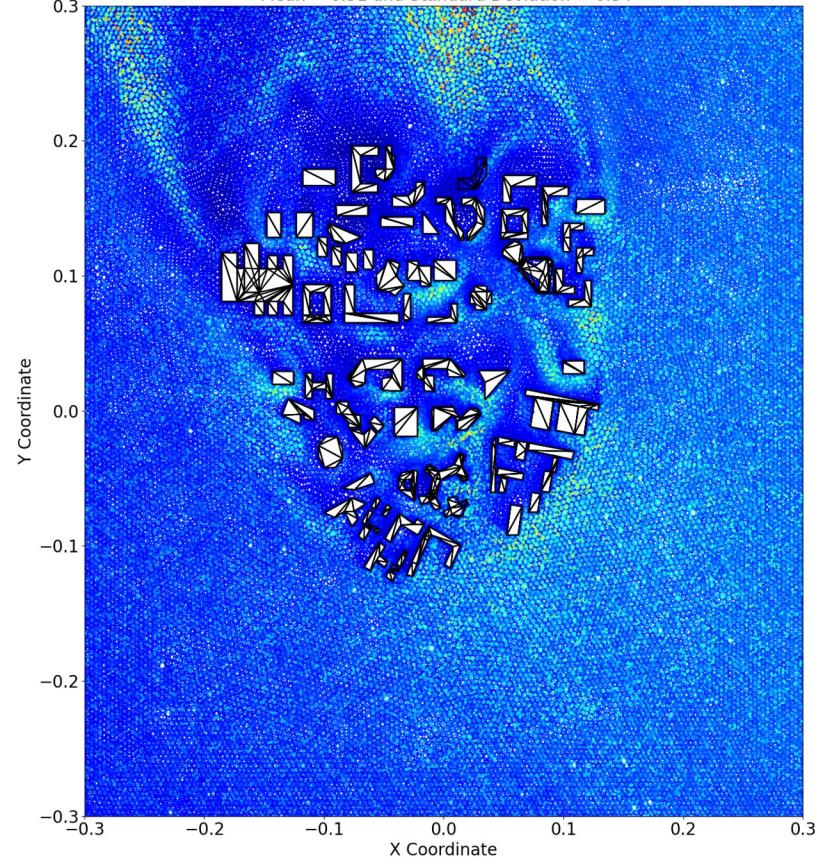


Velocity Magnitude Difference in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01 with mean = -0.17 and std dev = 0.25

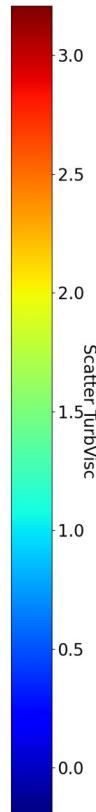
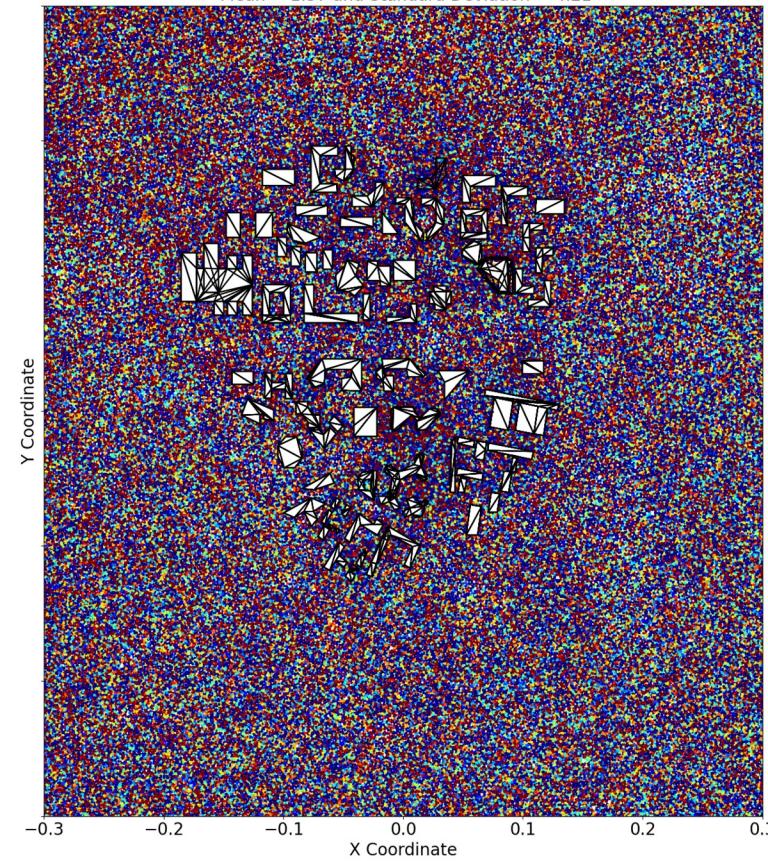


Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Y Plane with a cut at Z = 0.01 +/- 0.01

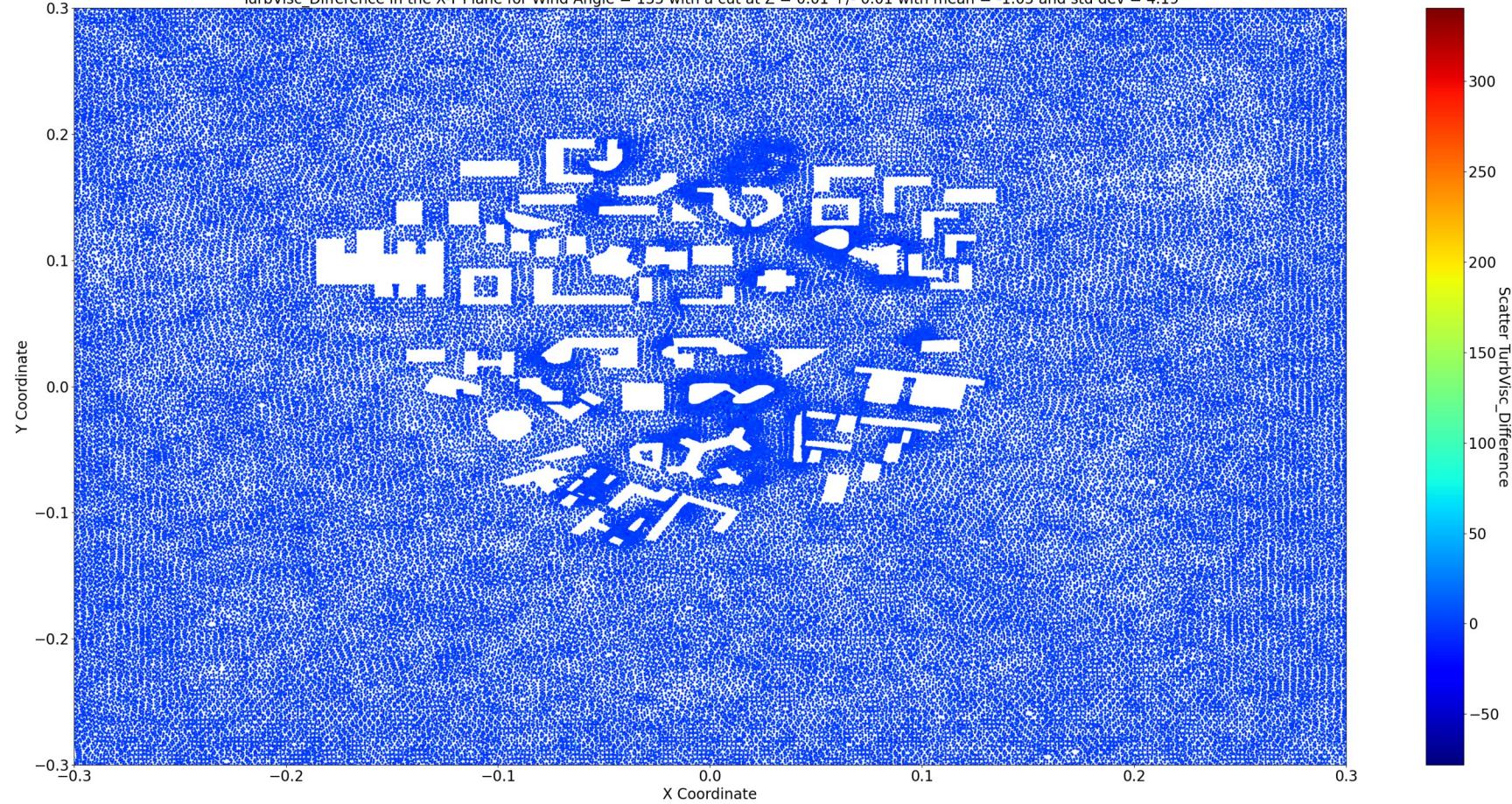
Actual TurbVisc in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01
Mean = 0.51 and Standard Deviation = 0.34



Predicted TurbVisc in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01
Mean = 1.57 and Standard Deviation = 4.21

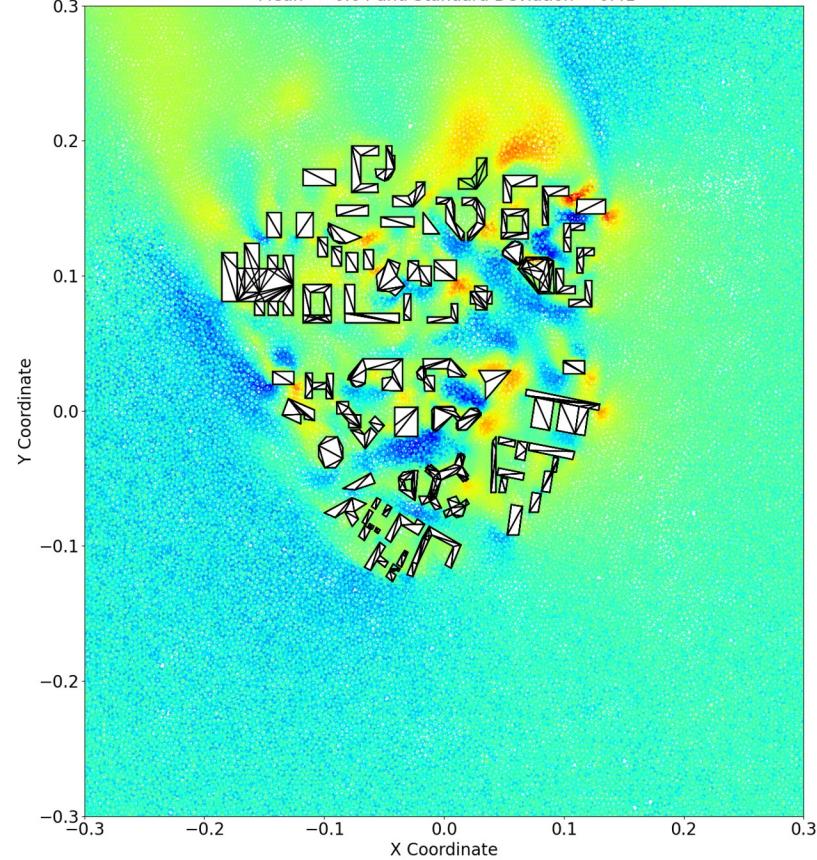


TurbVisc_Difference in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01 with mean = -1.05 and std dev = 4.19

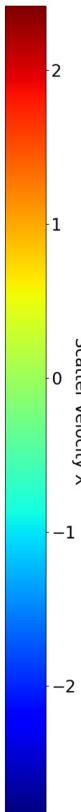
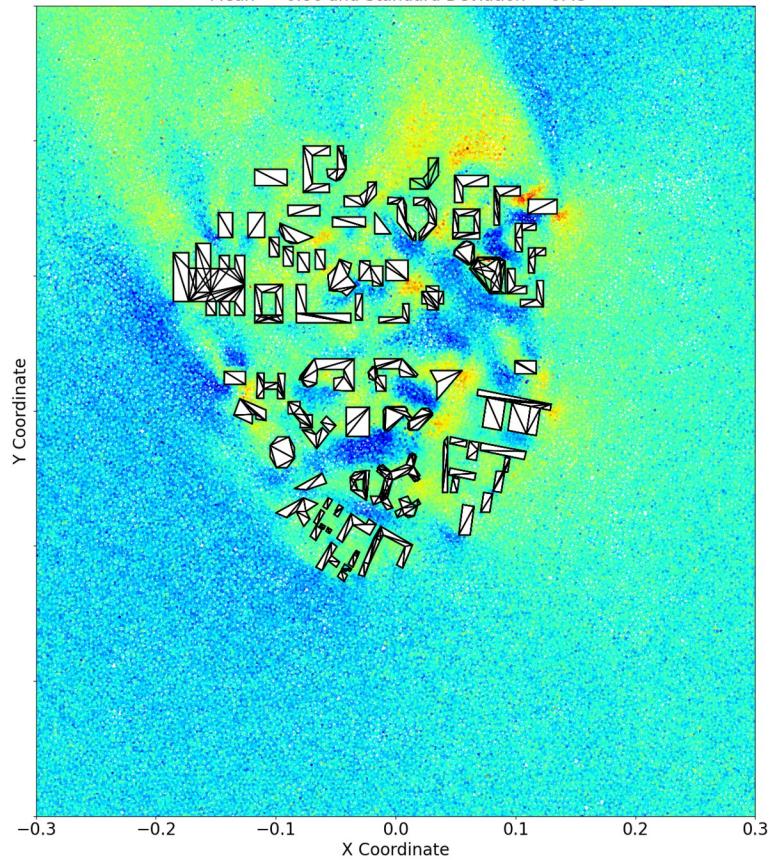


Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Y Plane with a cut at Z = 0.01 +/- 0.01

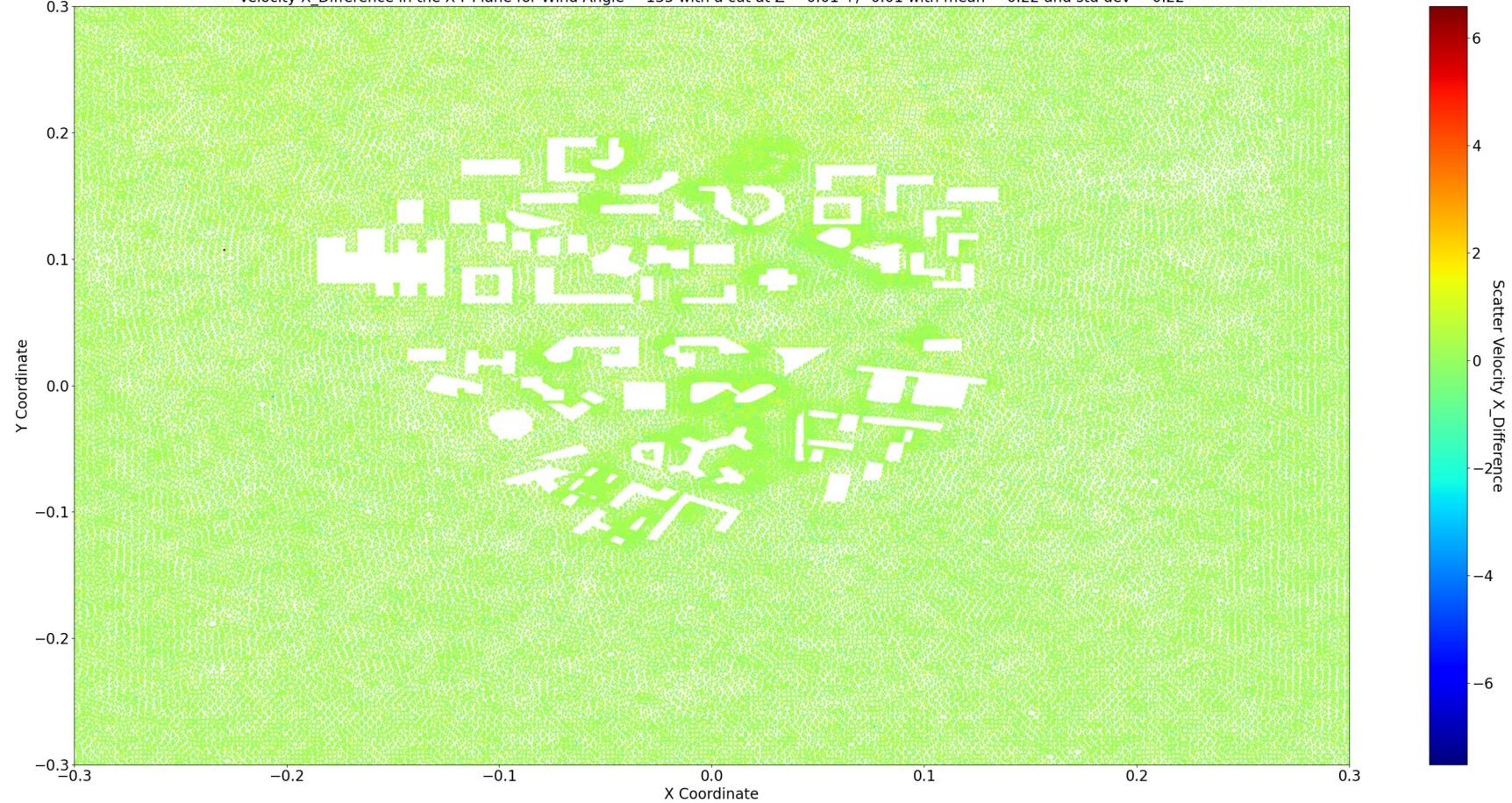
Actual Velocity X in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01
Mean = -0.64 and Standard Deviation = 0.41



Predicted Velocity X in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01
Mean = -0.86 and Standard Deviation = 0.45

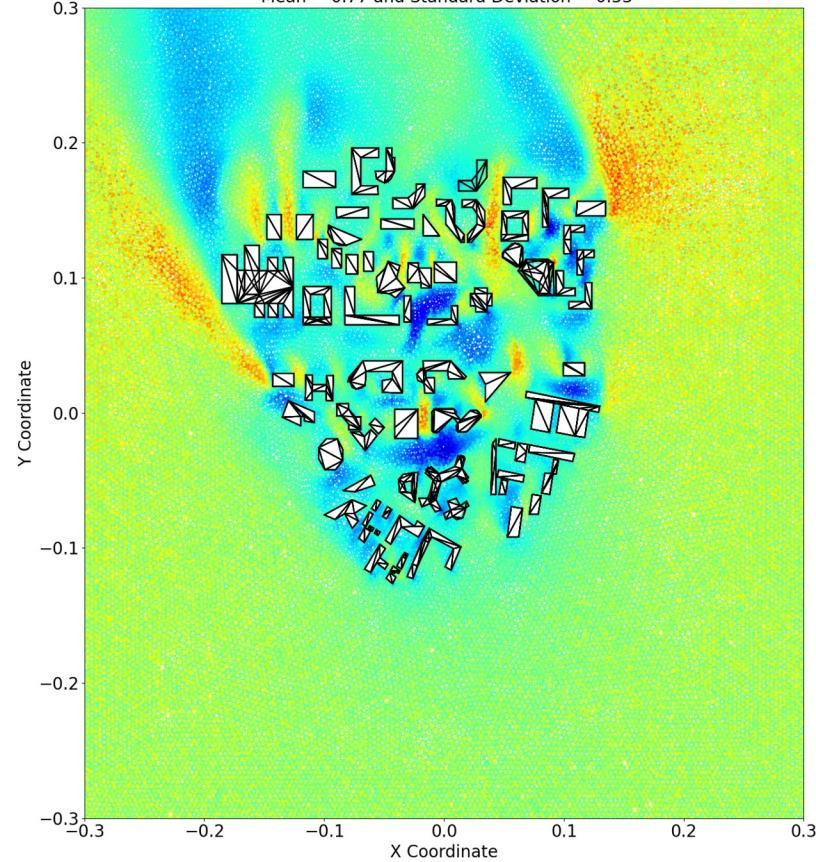


Velocity X_Difference in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01 with mean = 0.22 and std dev = 0.22

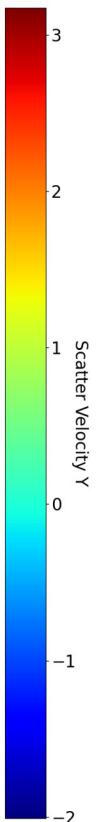
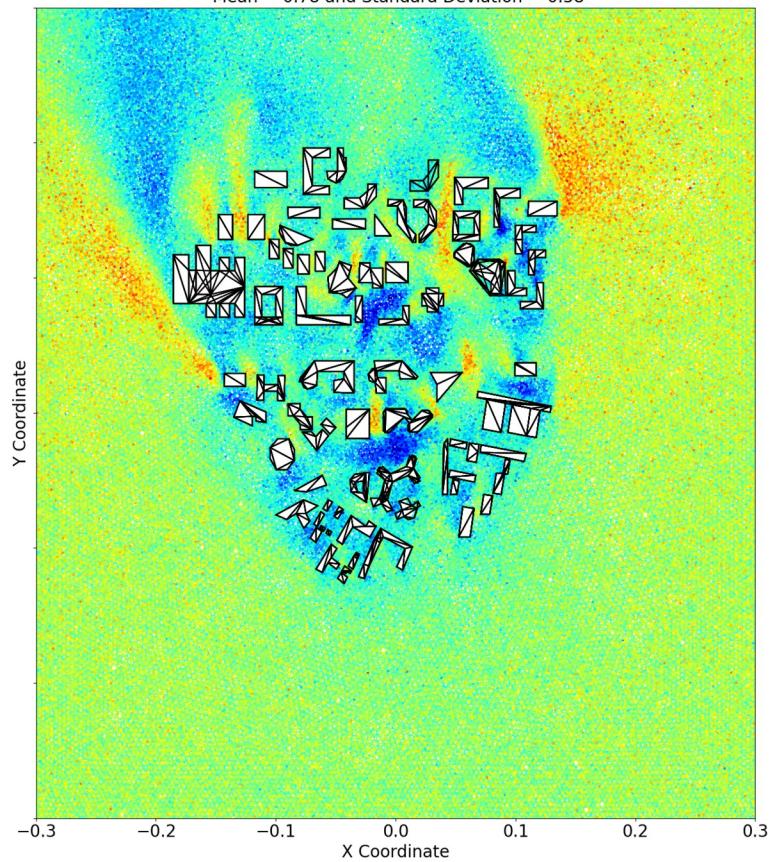


Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Y Plane with a cut at Z = 0.01 +/- 0.01

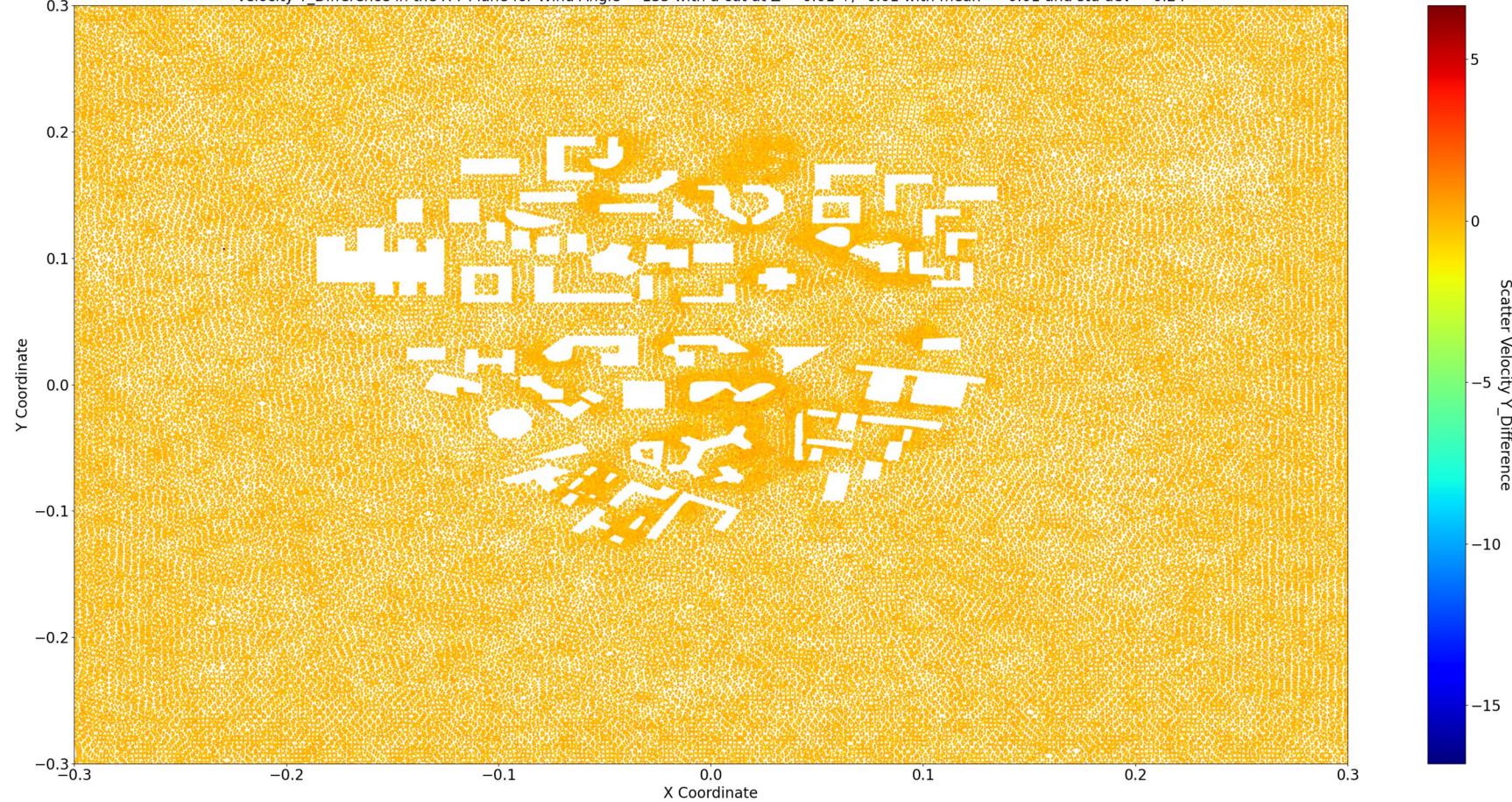
Actual Velocity Y in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01
Mean = 0.77 and Standard Deviation = 0.53



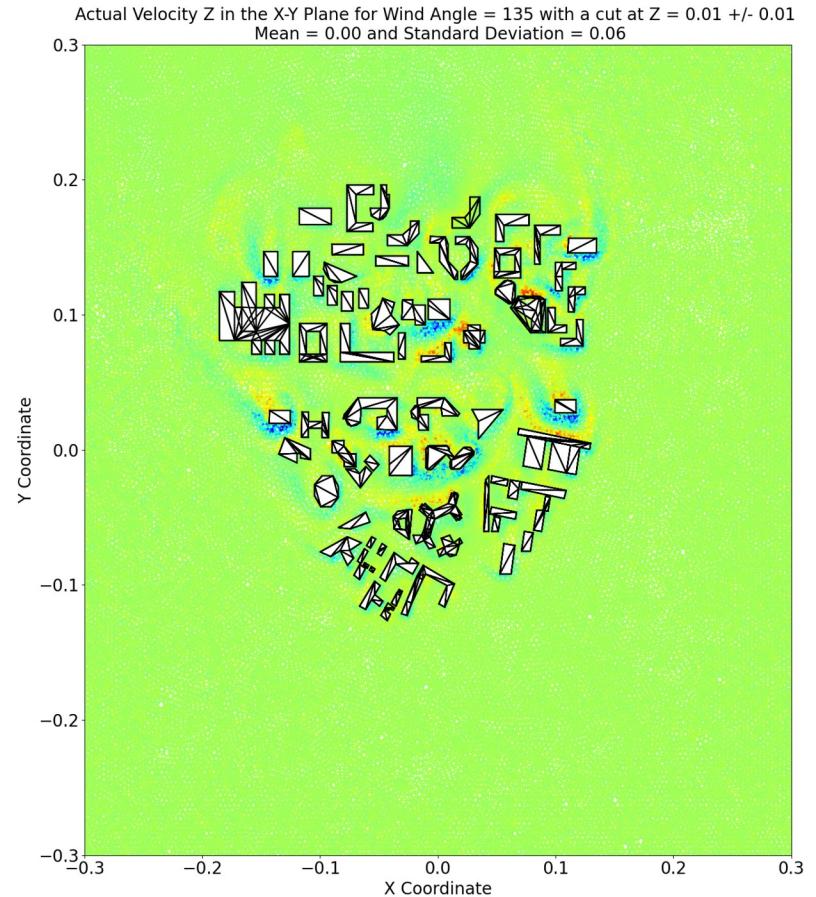
Predicted Velocity Y in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01
Mean = 0.78 and Standard Deviation = 0.58



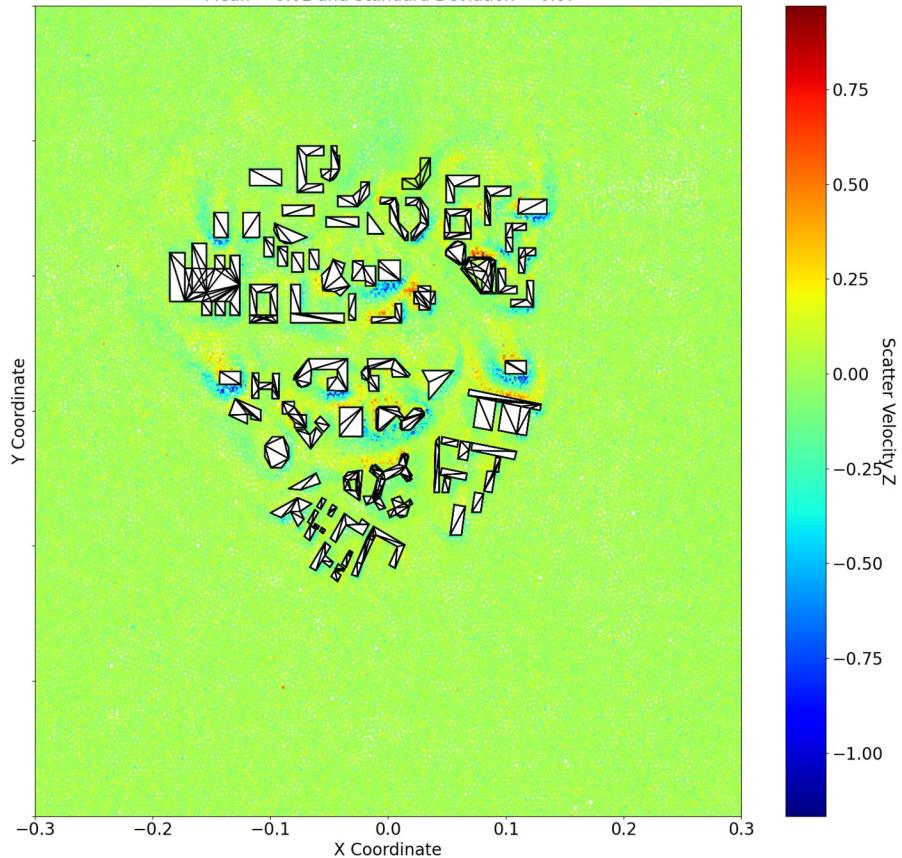
Velocity Y_Difference in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01 with mean = -0.01 and std dev = 0.24



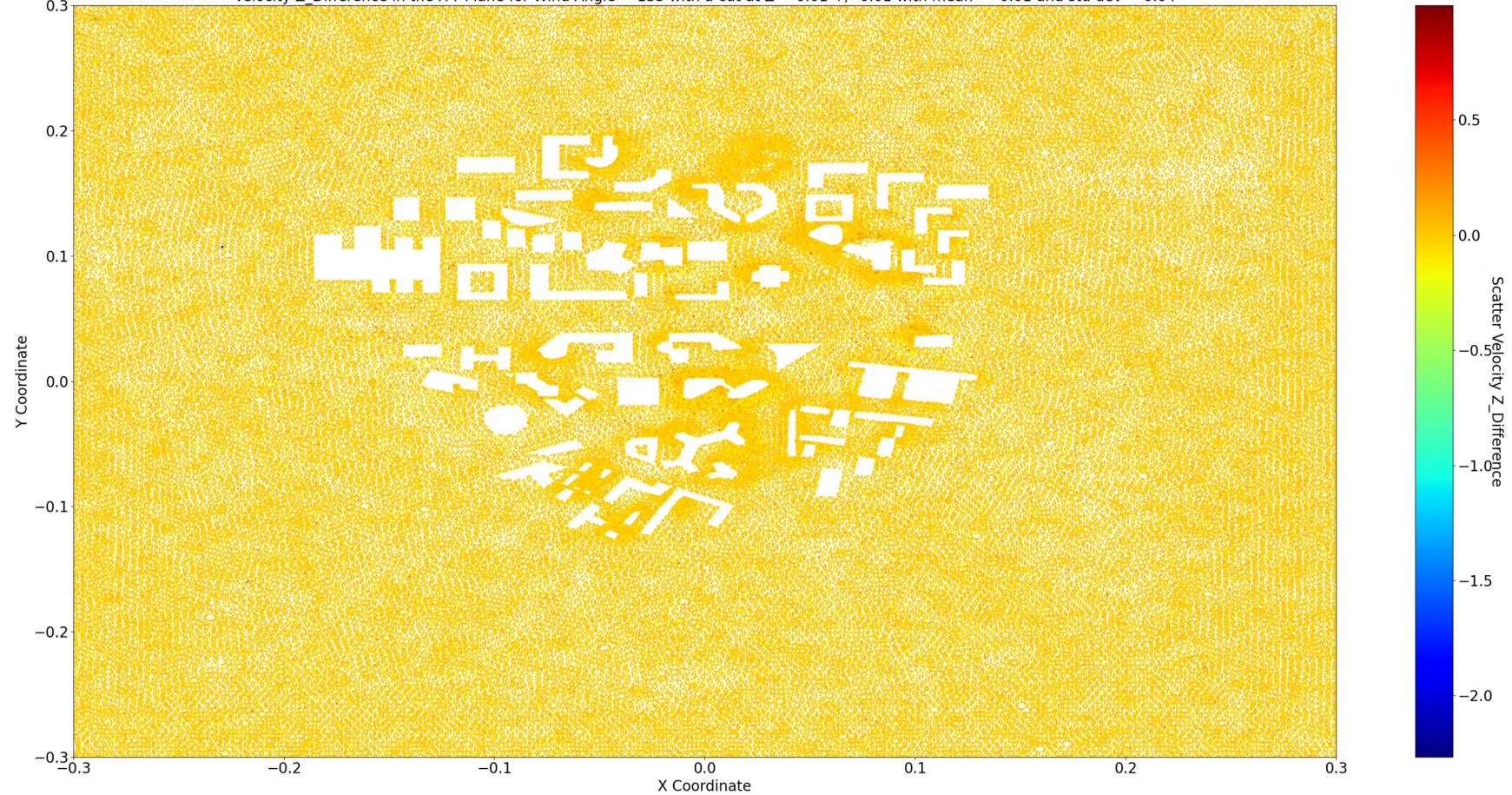
Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Y Plane with a cut at Z = 0.01 +/- 0.01



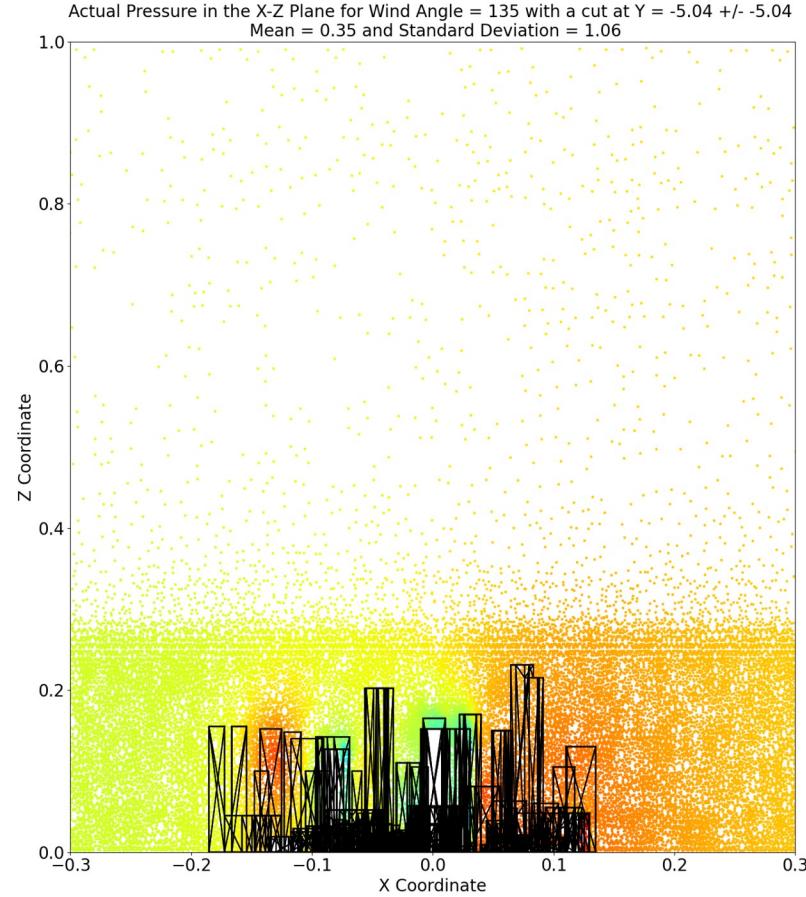
Predicted Velocity Z in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01
Mean = 0.01 and Standard Deviation = 0.07



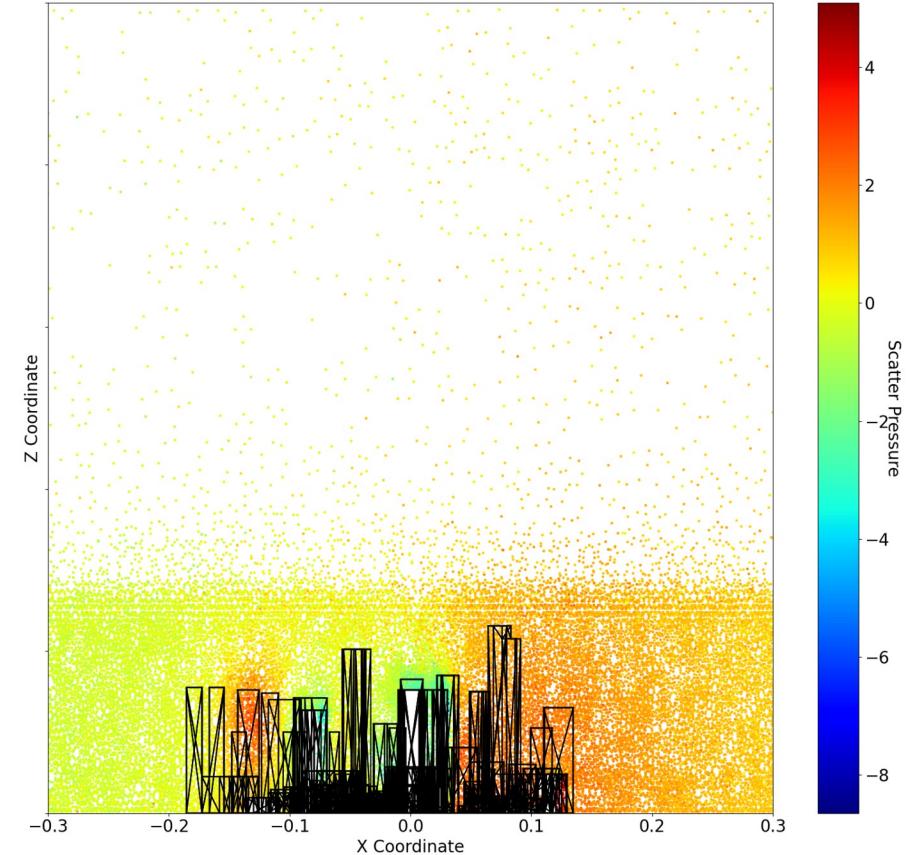
Velocity Z_Difference in the X-Y Plane for Wind Angle = 135 with a cut at Z = 0.01 +/- 0.01 with mean = -0.01 and std dev = 0.04



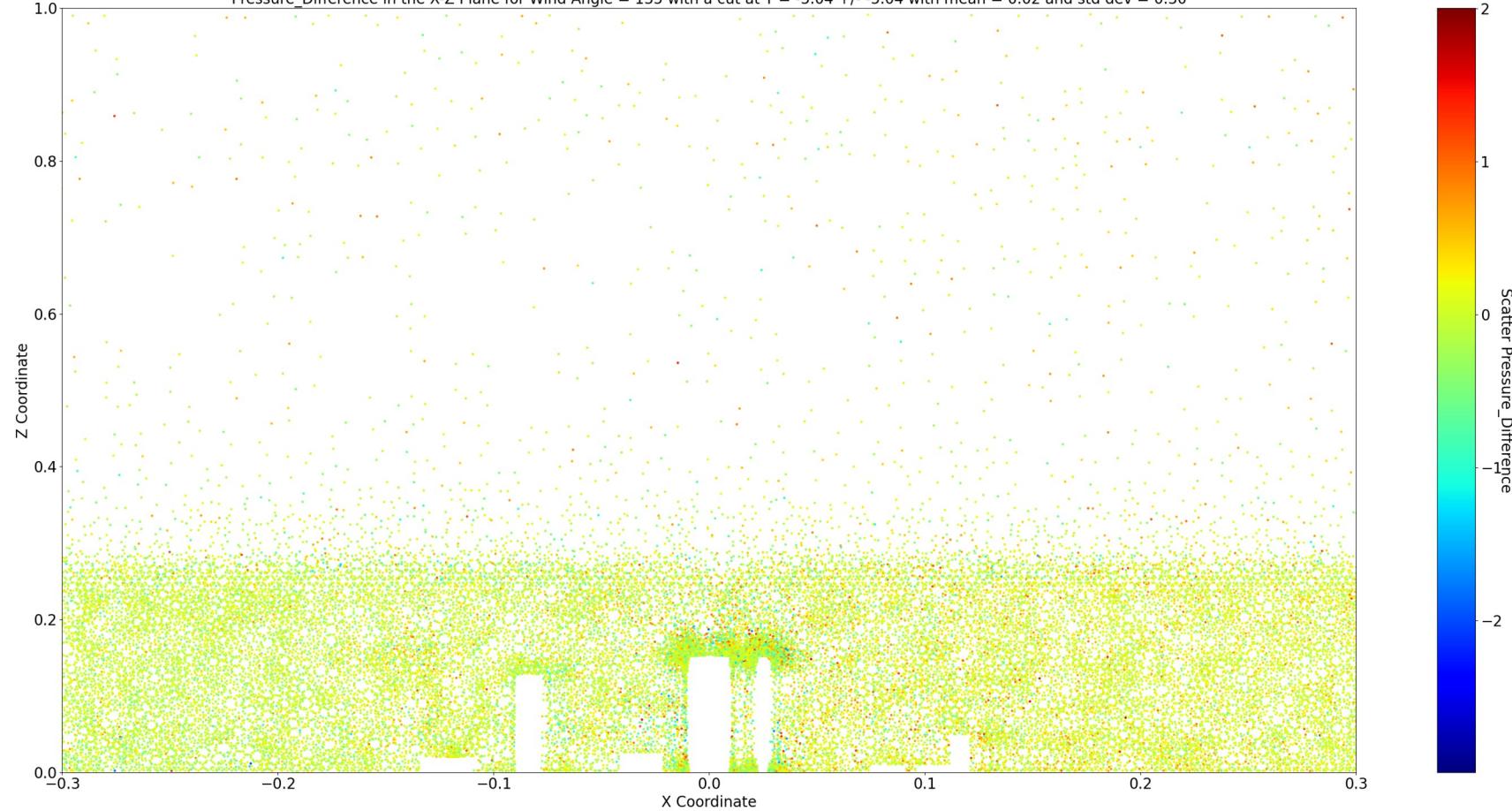
Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Z Plane with a cut at Y = -5.04 +/- -5.04



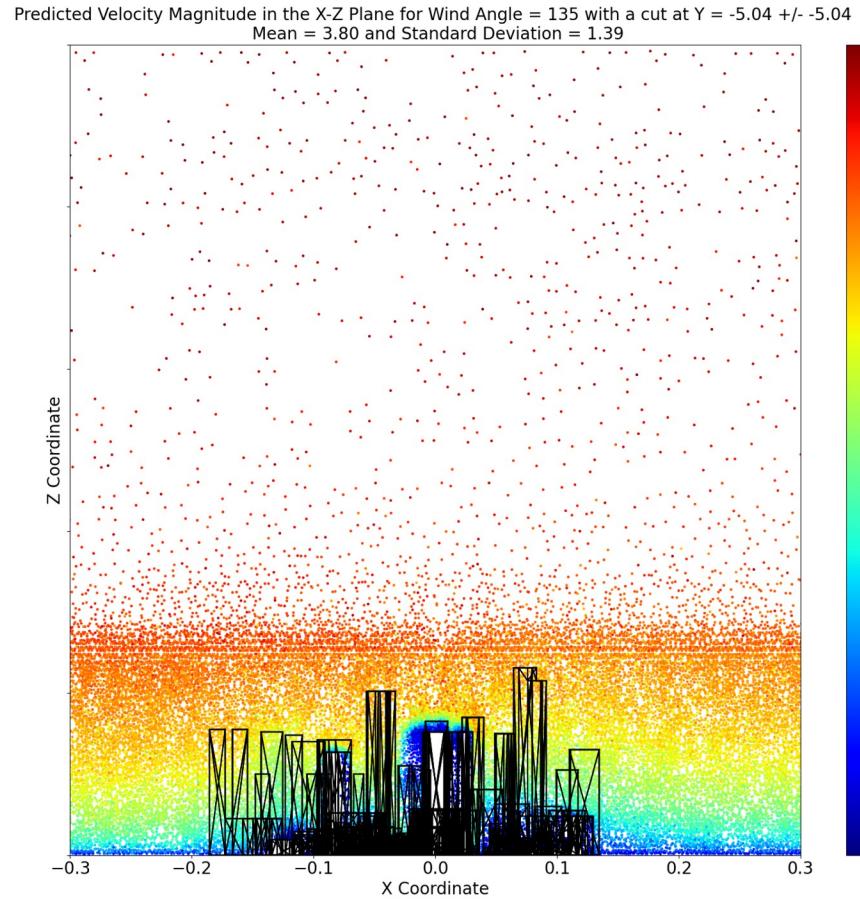
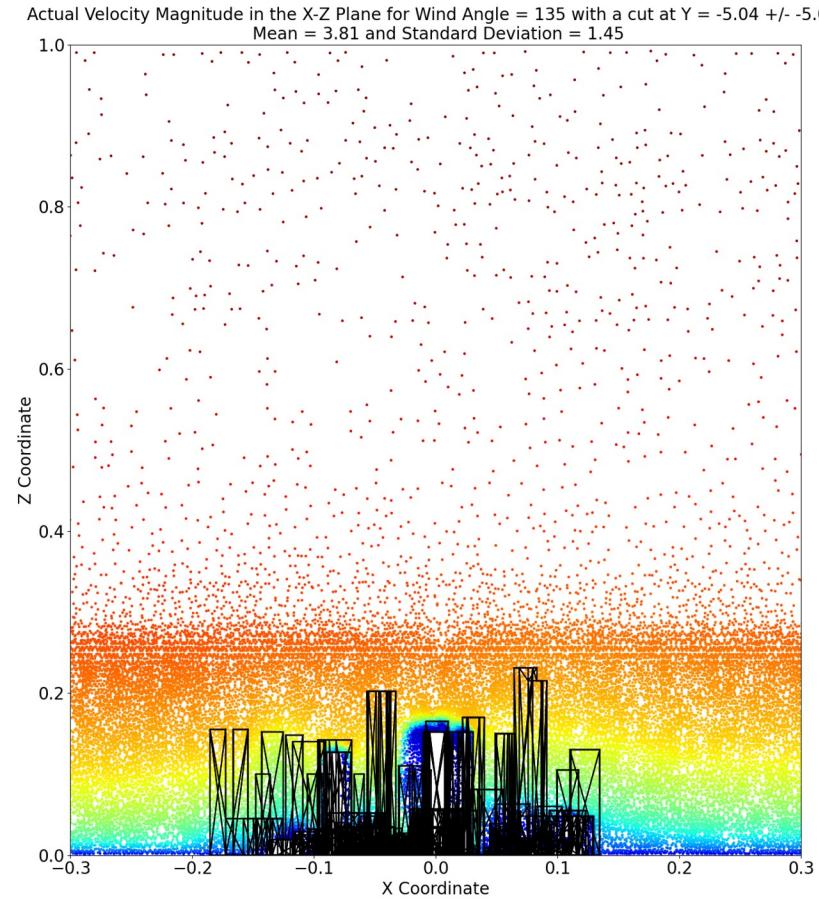
Predicted Pressure in the X-Z Plane for Wind Angle = 135 with a cut at Y = -5.04 +/- -5.04
Mean = 0.34 and Standard Deviation = 1.05

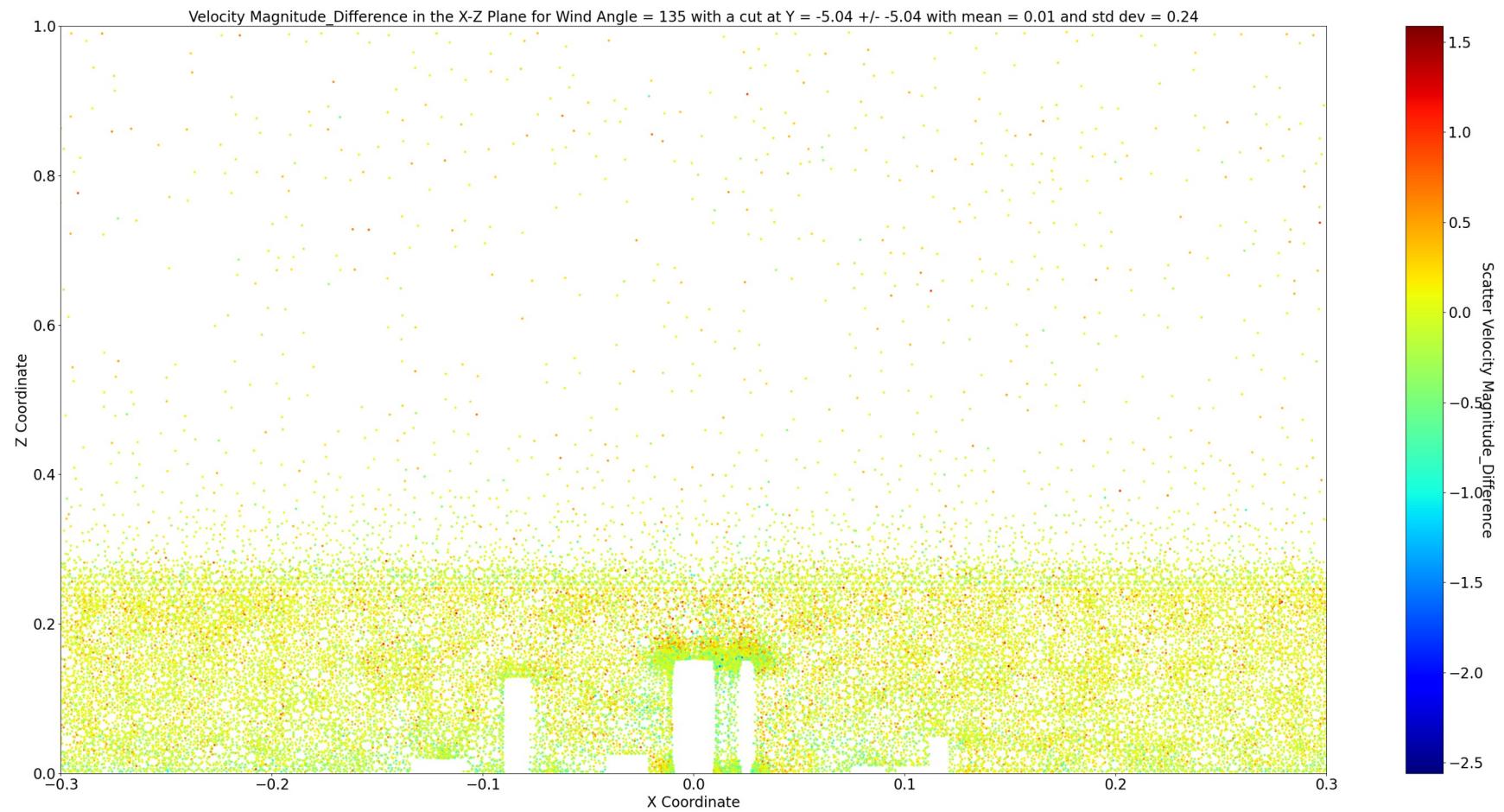


Pressure_Difference in the X-Z Plane for Wind Angle = 135 with a cut at Y = -5.04 +/- 5.04 with mean = 0.02 and std dev = 0.30

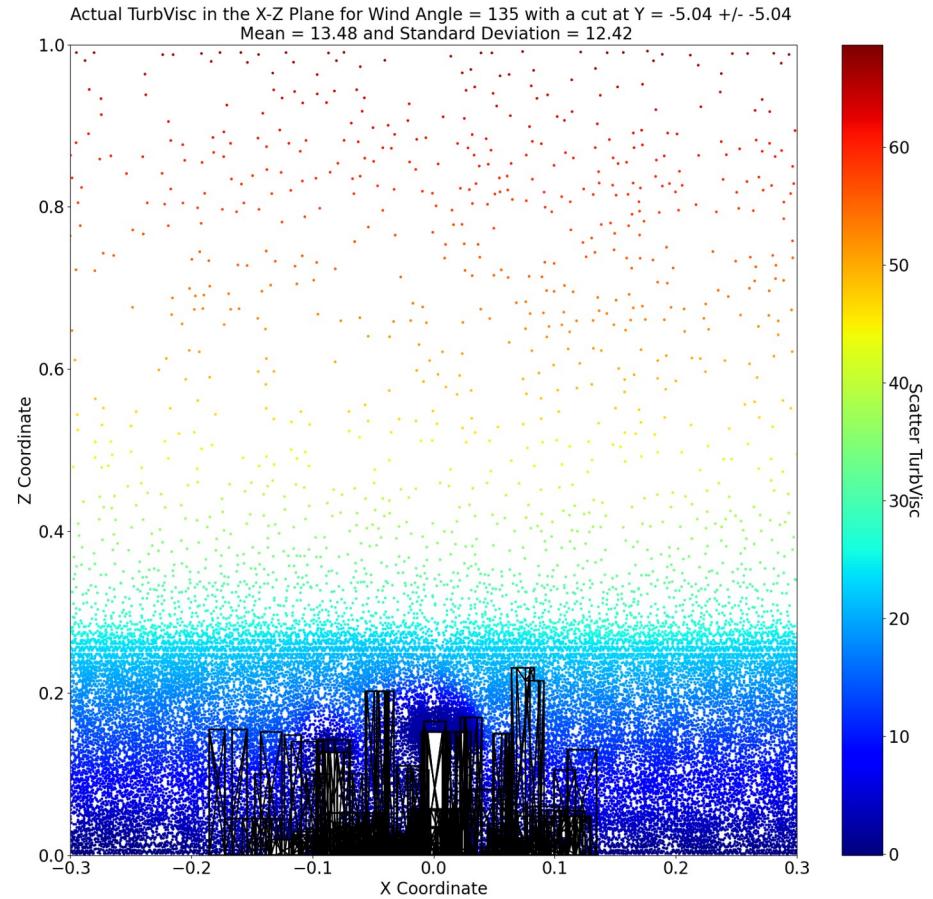


Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Z Plane with a cut at Y = -5.04 +/- -5.04

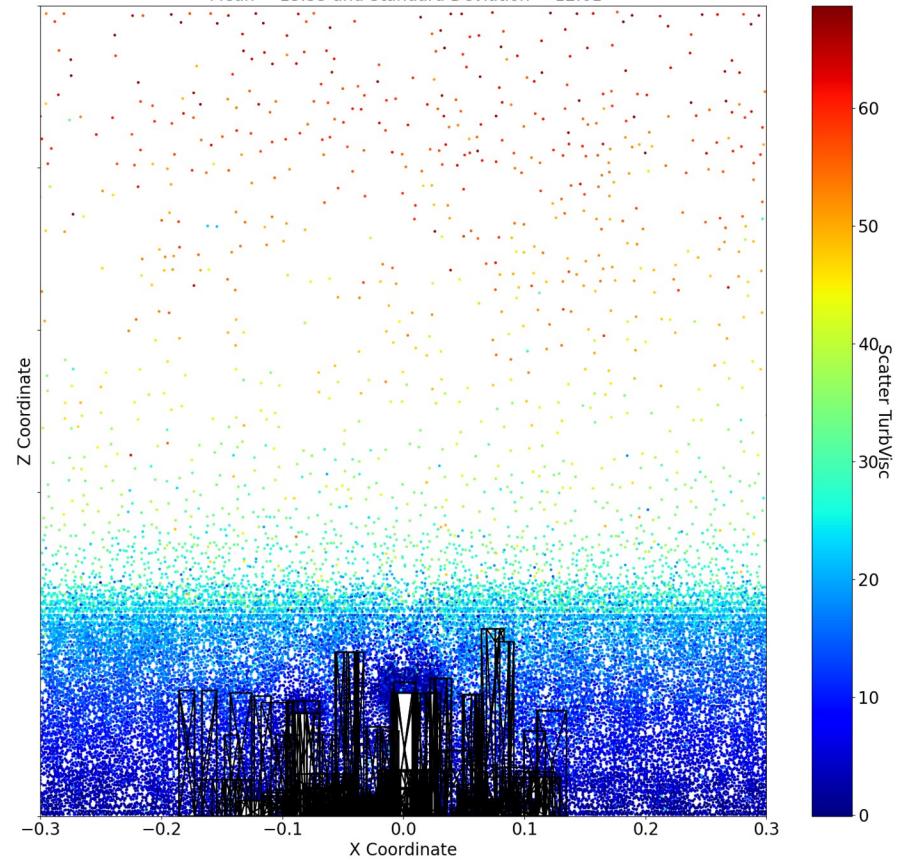




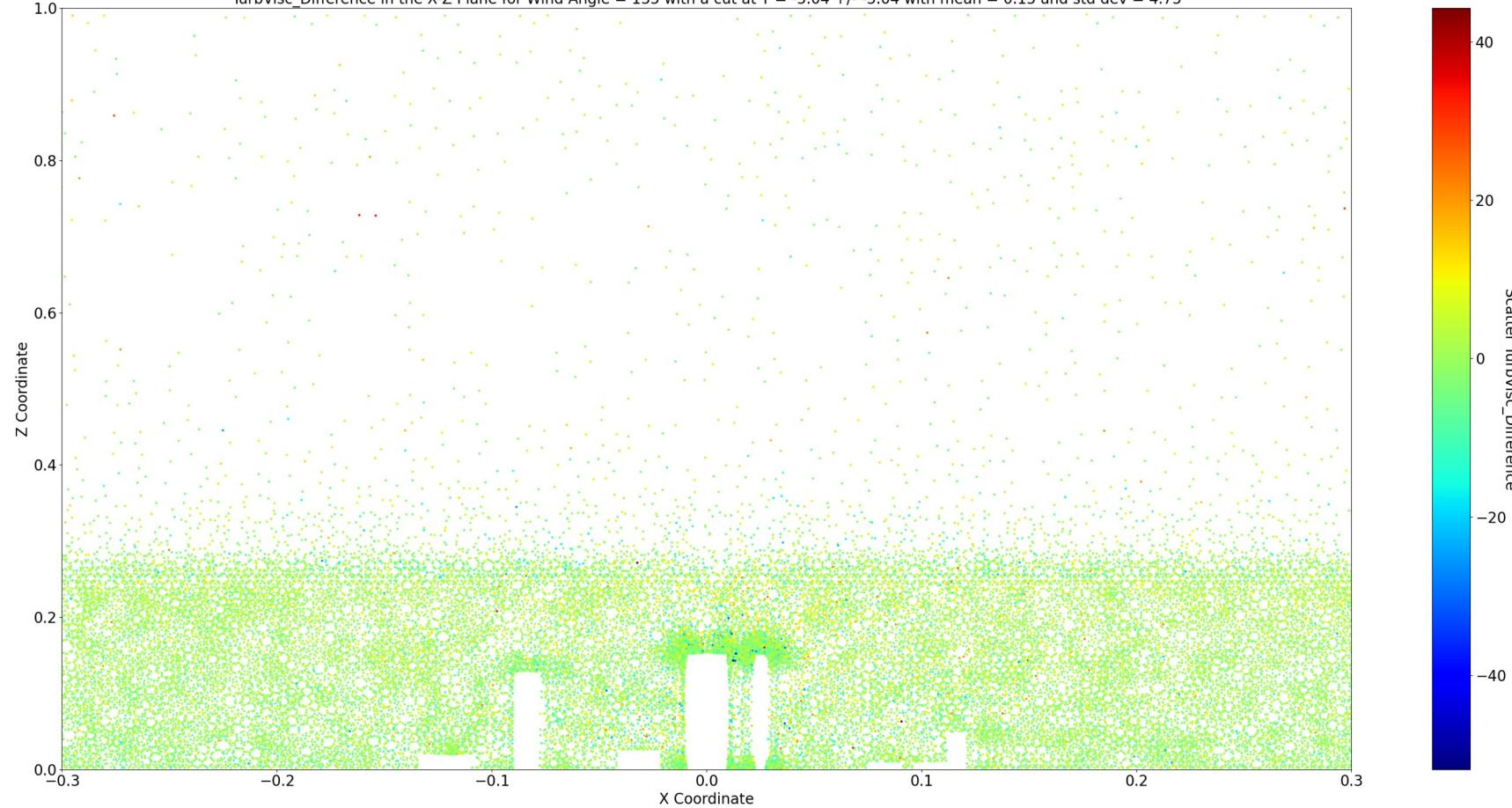
Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Z Plane with a cut at Y = -5.04 +/- -5.04



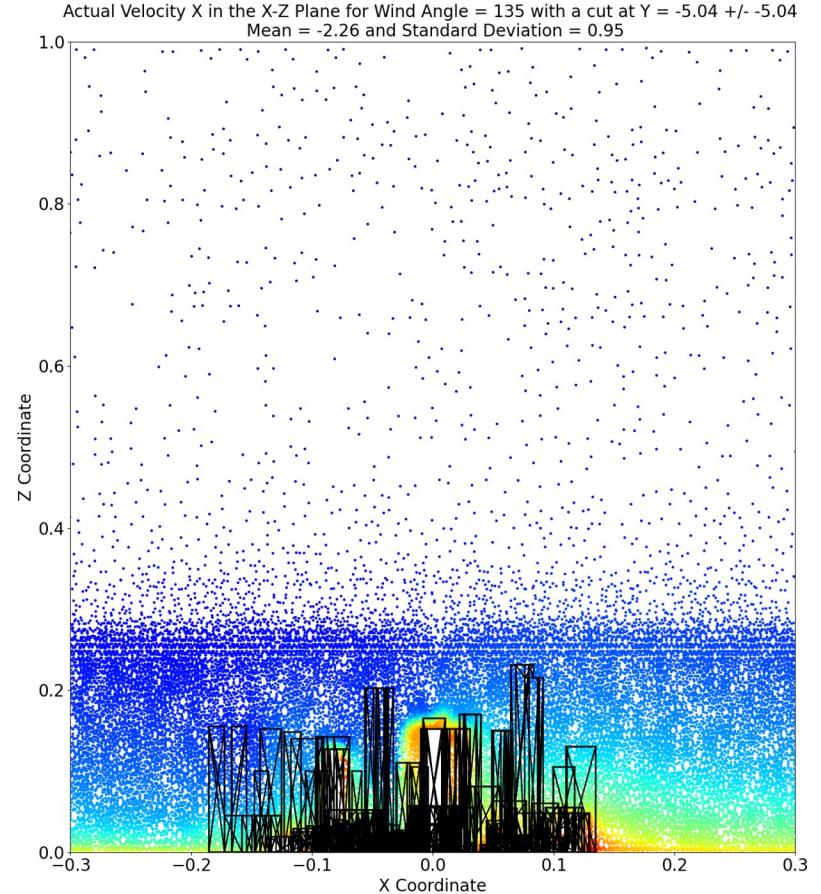
Predicted TurbVisc in the X-Z Plane for Wind Angle = 135 with a cut at Y = -5.04 +/- -5.04
Mean = 13.33 and Standard Deviation = 12.61



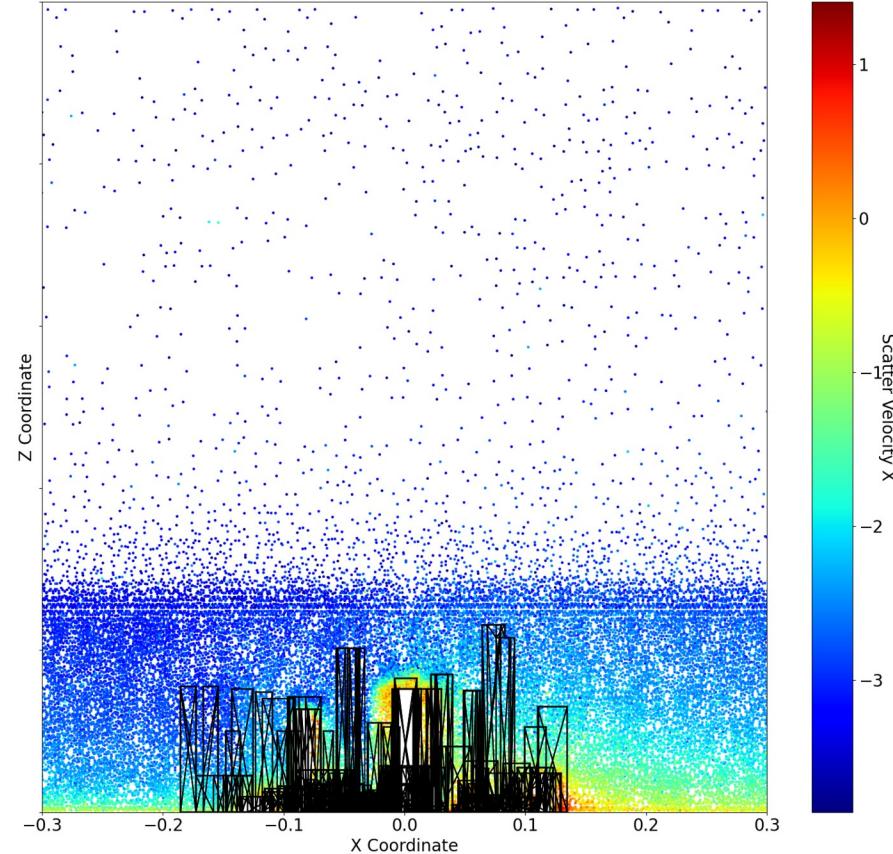
TurbVisc_Difference in the X-Z Plane for Wind Angle = 135 with a cut at Y = -5.04 +/- -5.04 with mean = 0.15 and std dev = 4.75



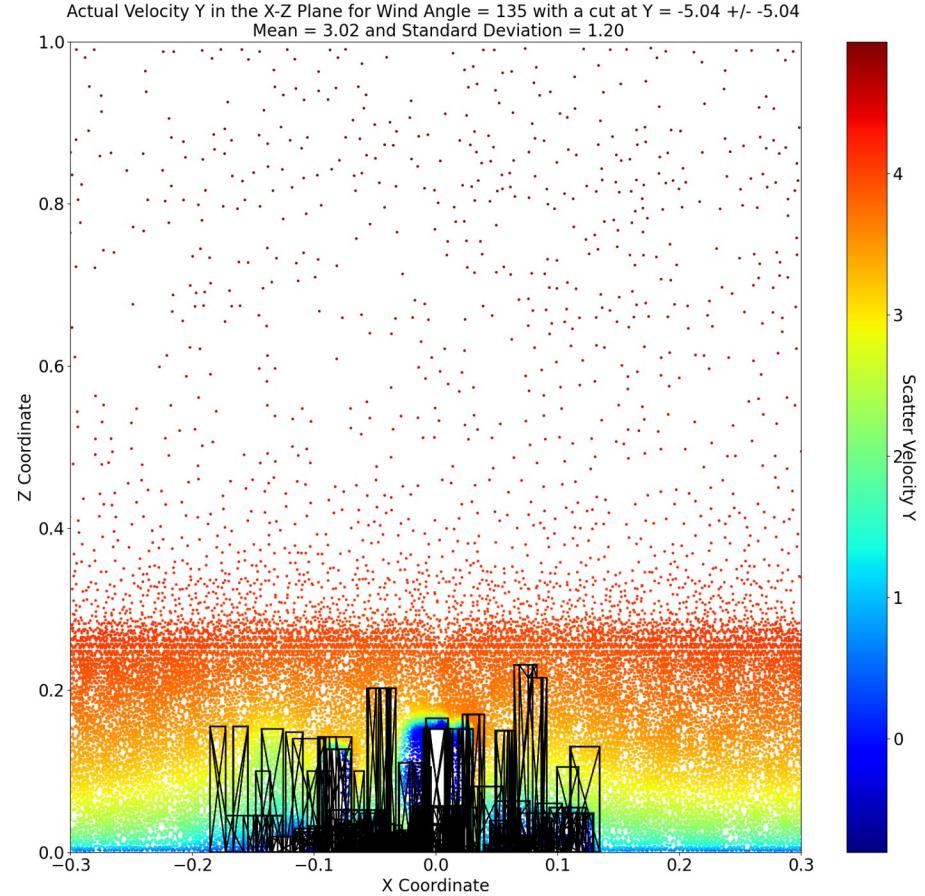
Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Z Plane with a cut at Y = -5.04 +/- -5.04



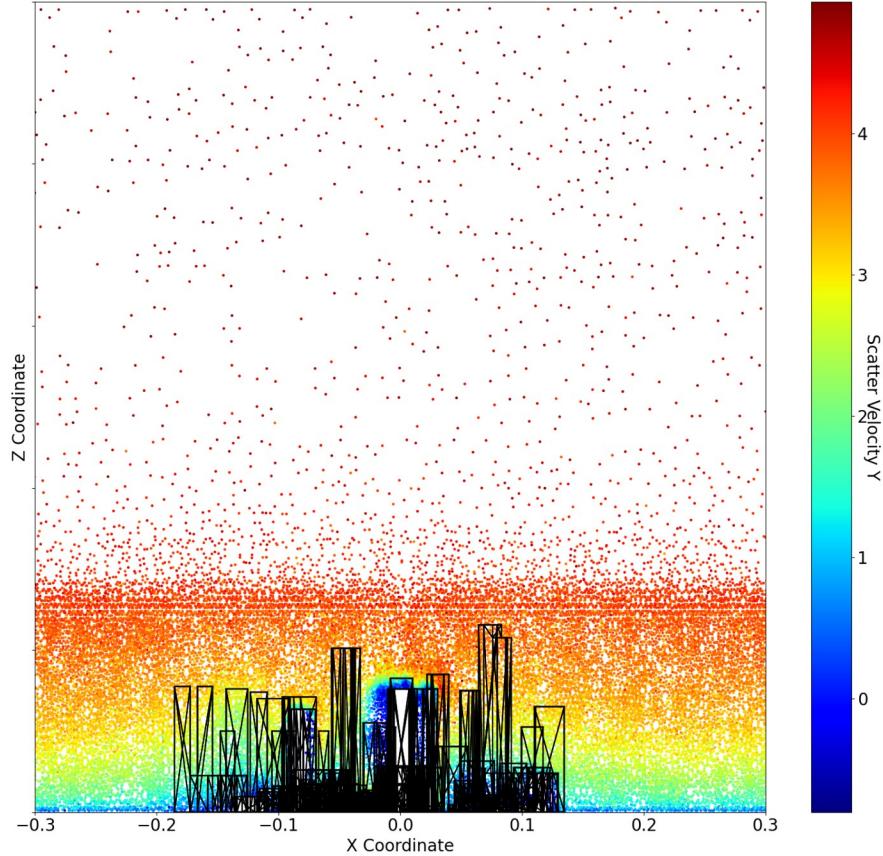
Predicted Velocity X in the X-Z Plane for Wind Angle = 135 with a cut at Y = -5.04 +/- -5.04
Mean = -2.26 and Standard Deviation = 0.90

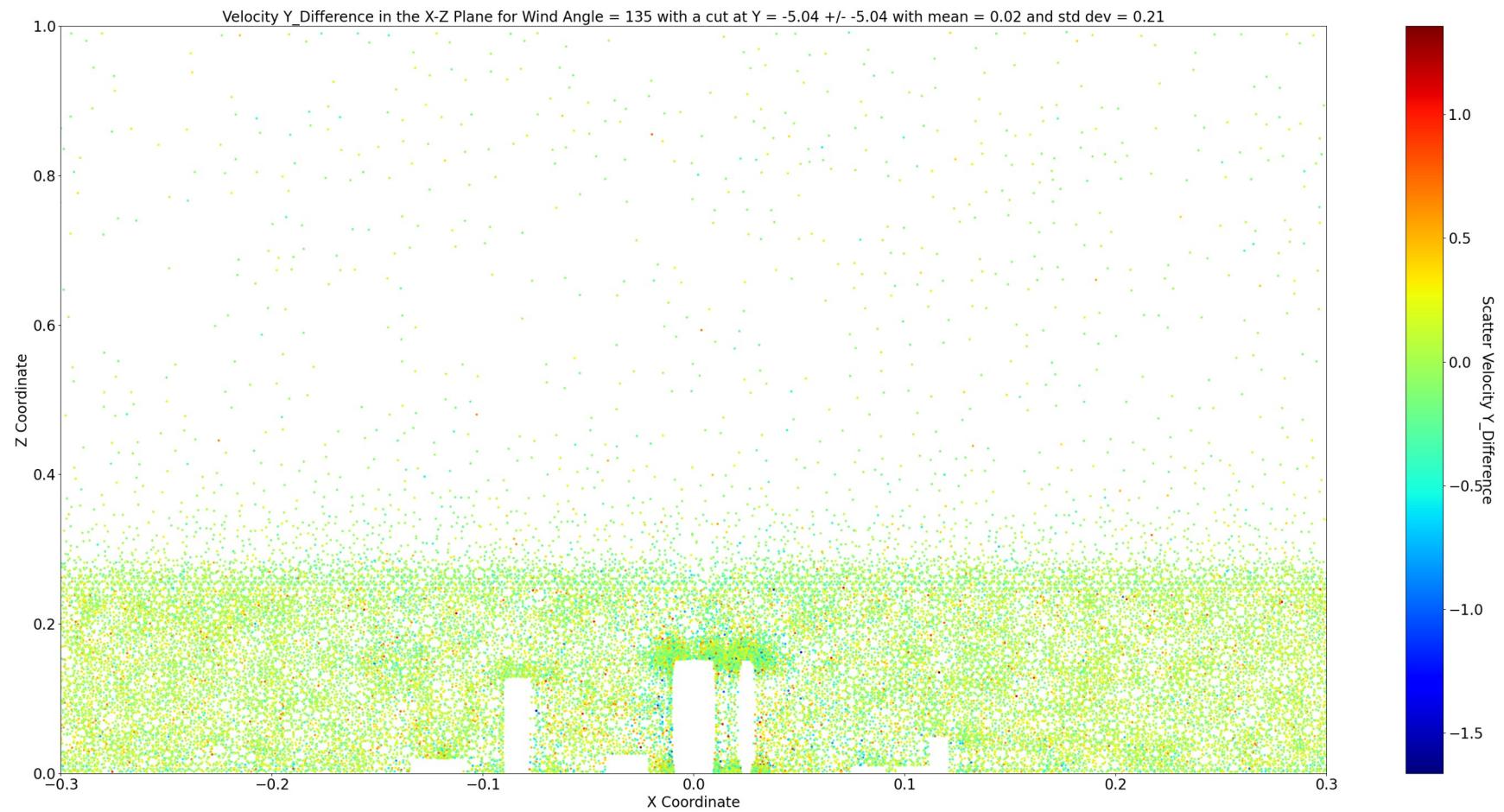


Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Z Plane with a cut at Y = -5.04 +/- -5.04

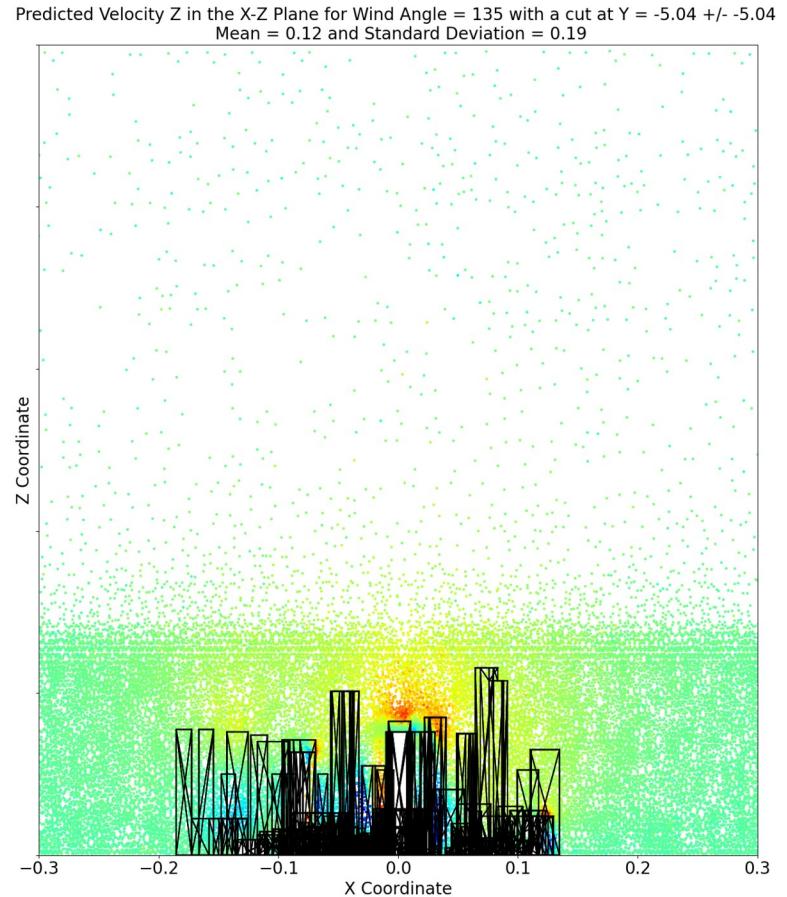
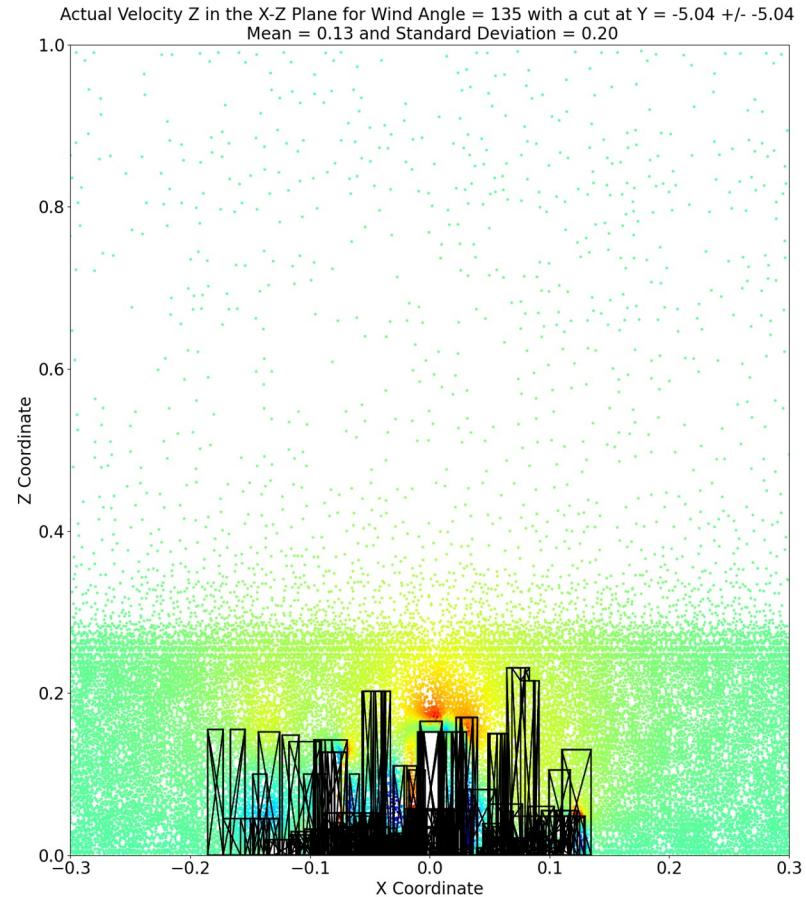


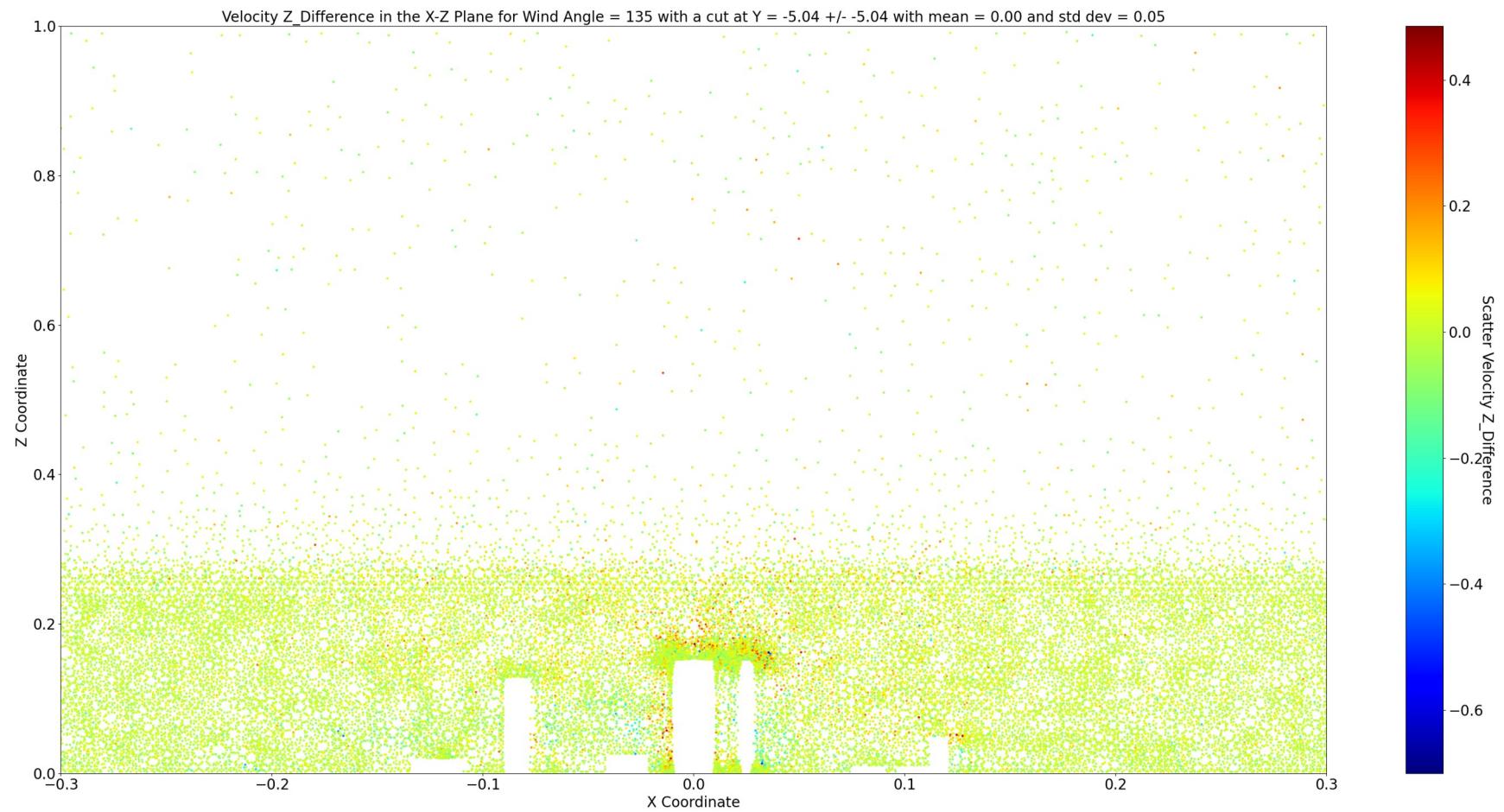
Predicted Velocity Y in the X-Z Plane for Wind Angle = 135 with a cut at Y = -5.04 +/- -5.04
Mean = 2.99 and Standard Deviation = 1.21



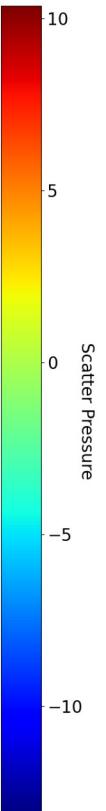
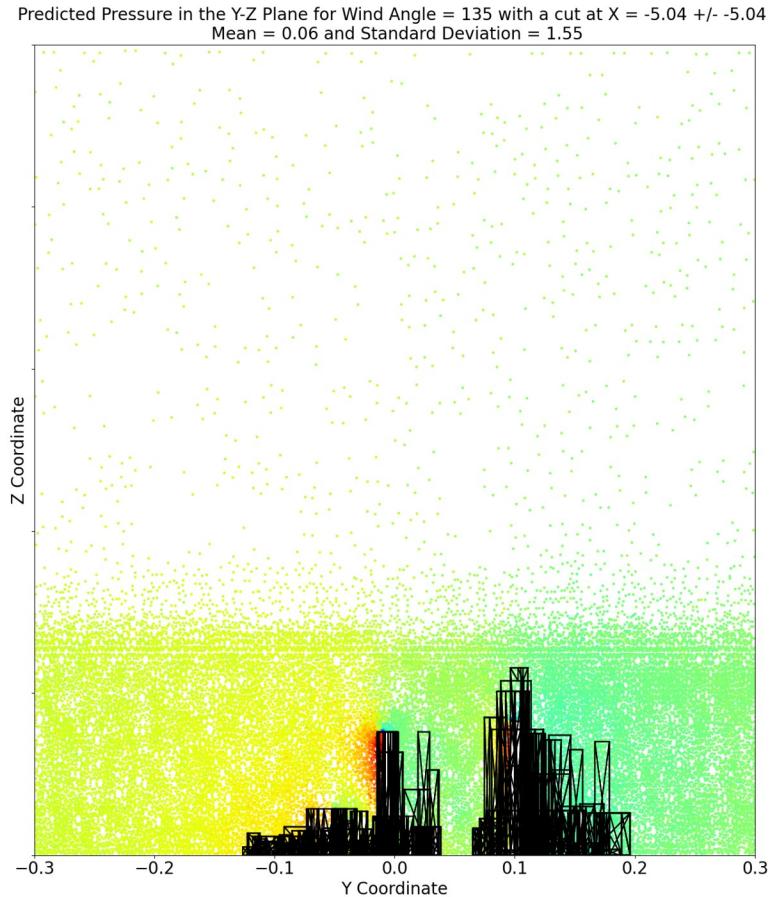
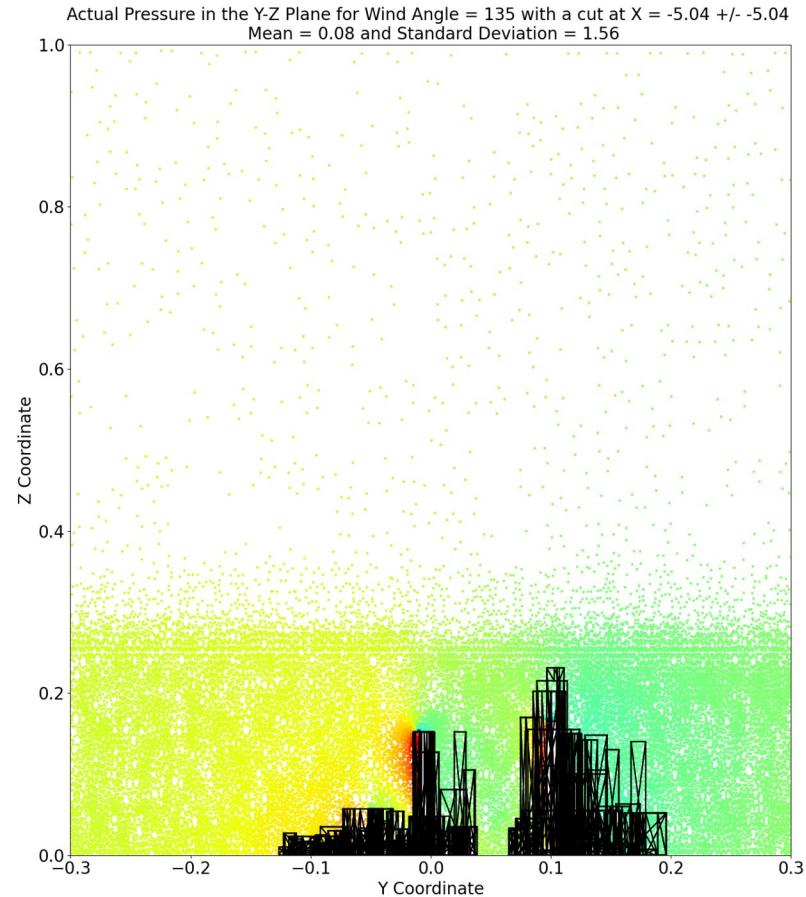


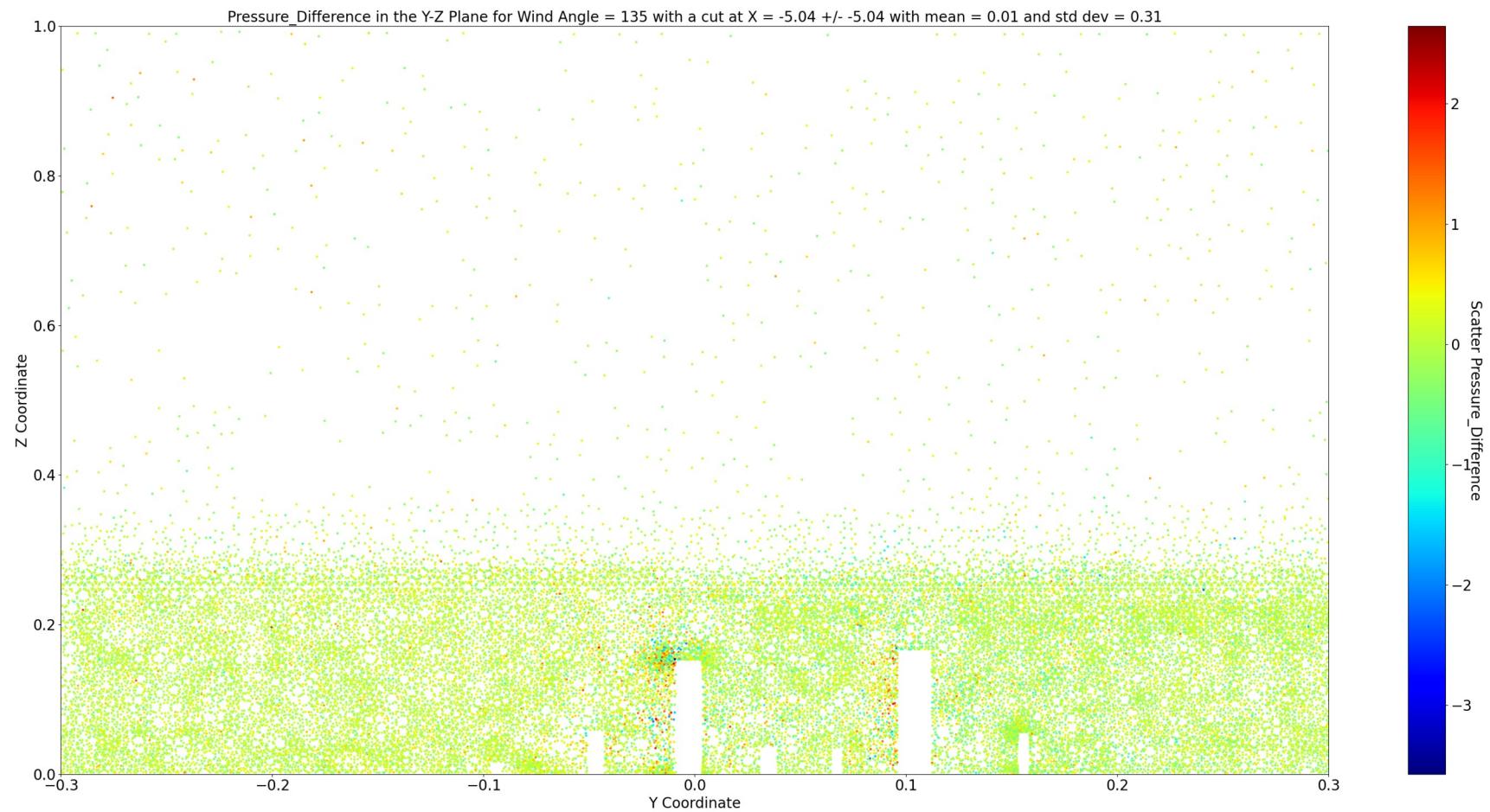
Comparison of Actual vs. Predicted values with Wind Angle = 135 in the X-Z Plane with a cut at Y = -5.04 +/- -5.04





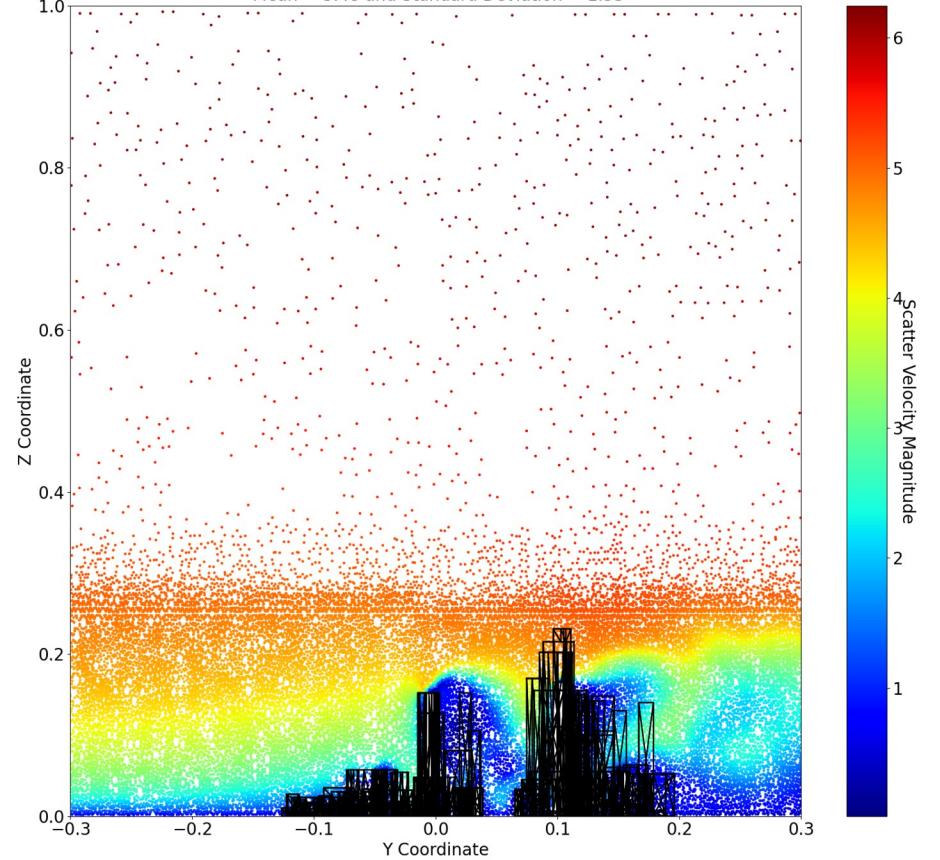
Comparison of Actual vs. Predicted values with Wind Angle = 135 in the Y-Z Plane with a cut at X = -5.04 +/- -5.04



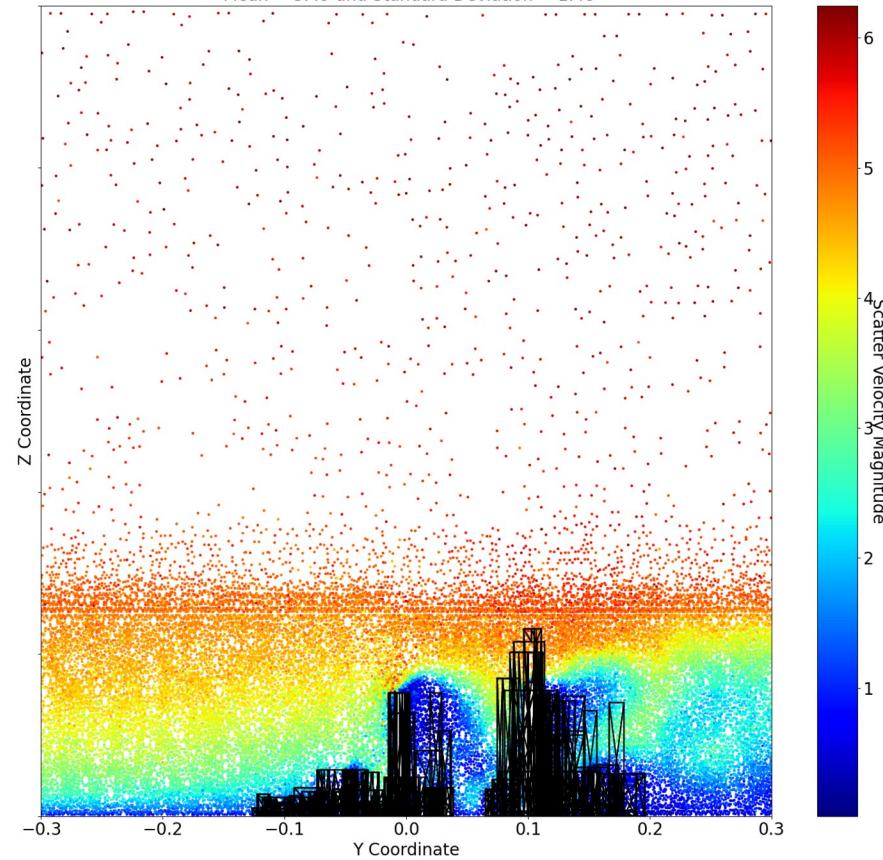


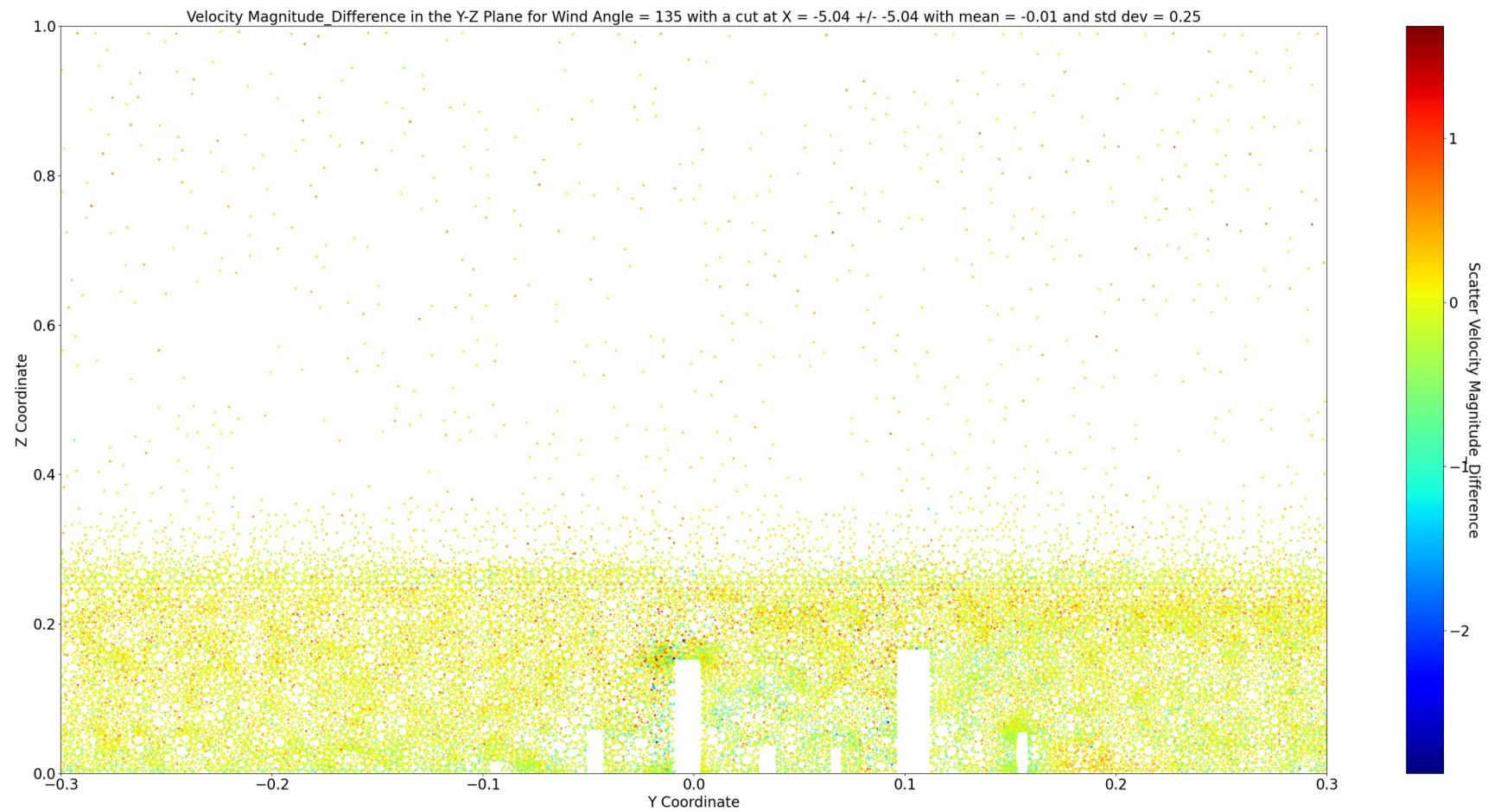
Comparison of Actual vs. Predicted values with Wind Angle = 135 in the Y-Z Plane with a cut at X = -5.04 +/- -5.04

Actual Velocity Magnitude in the Y-Z Plane for Wind Angle = 135 with a cut at X = -5.04 +/- -5.04
Mean = 3.48 and Standard Deviation = 1.53

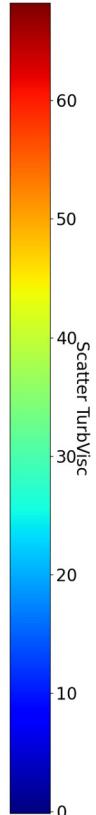
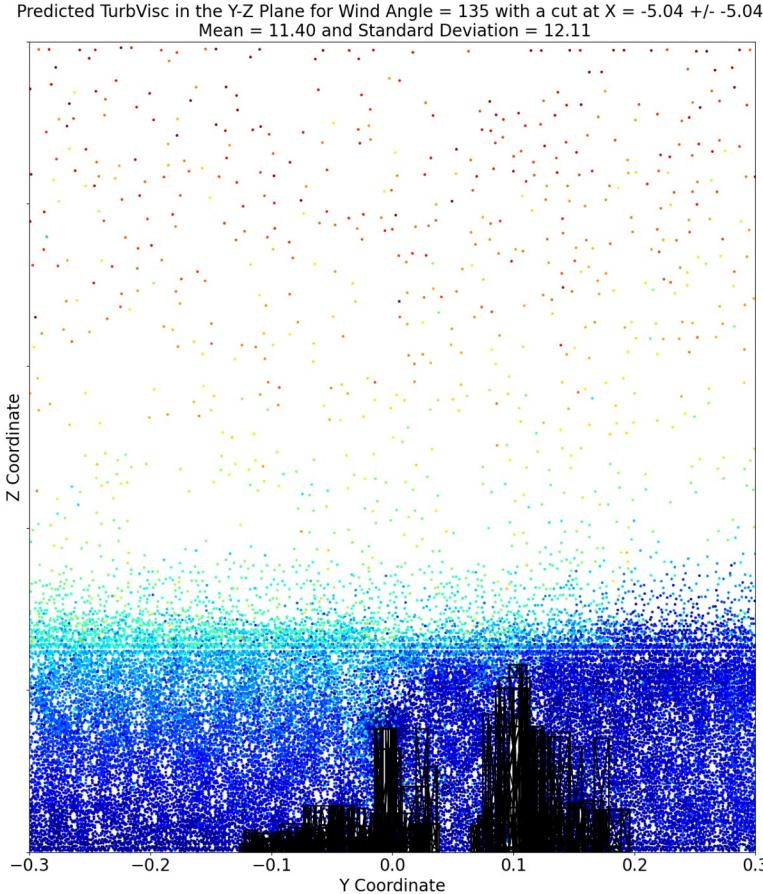
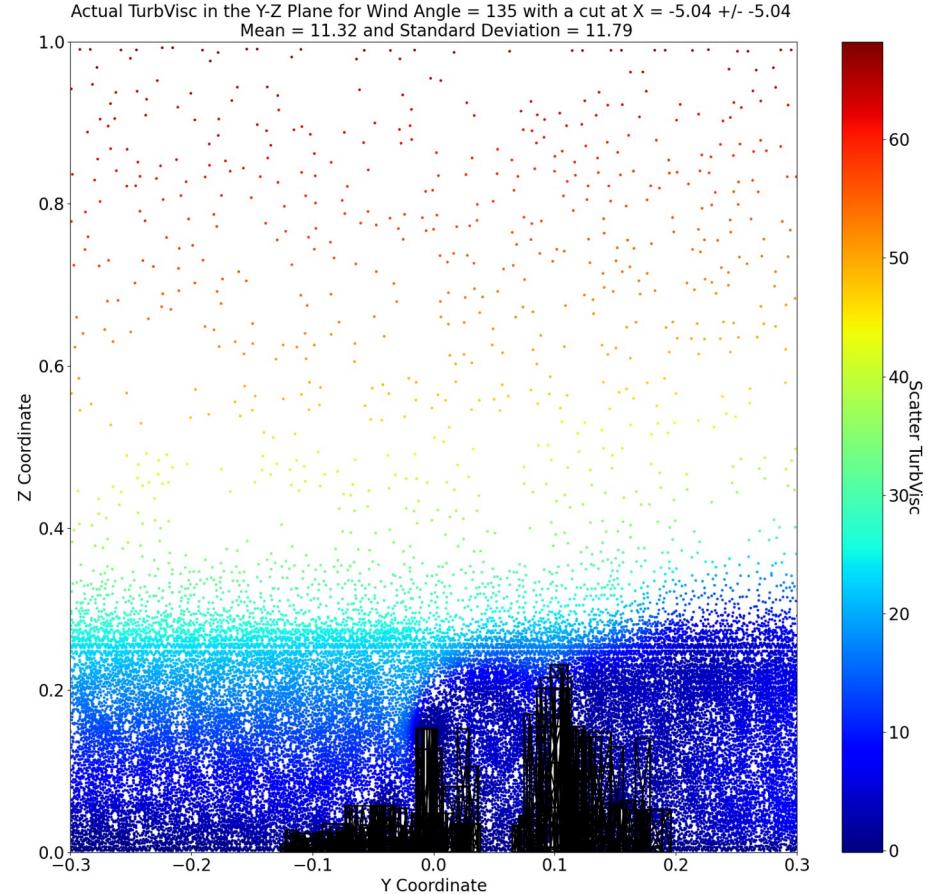


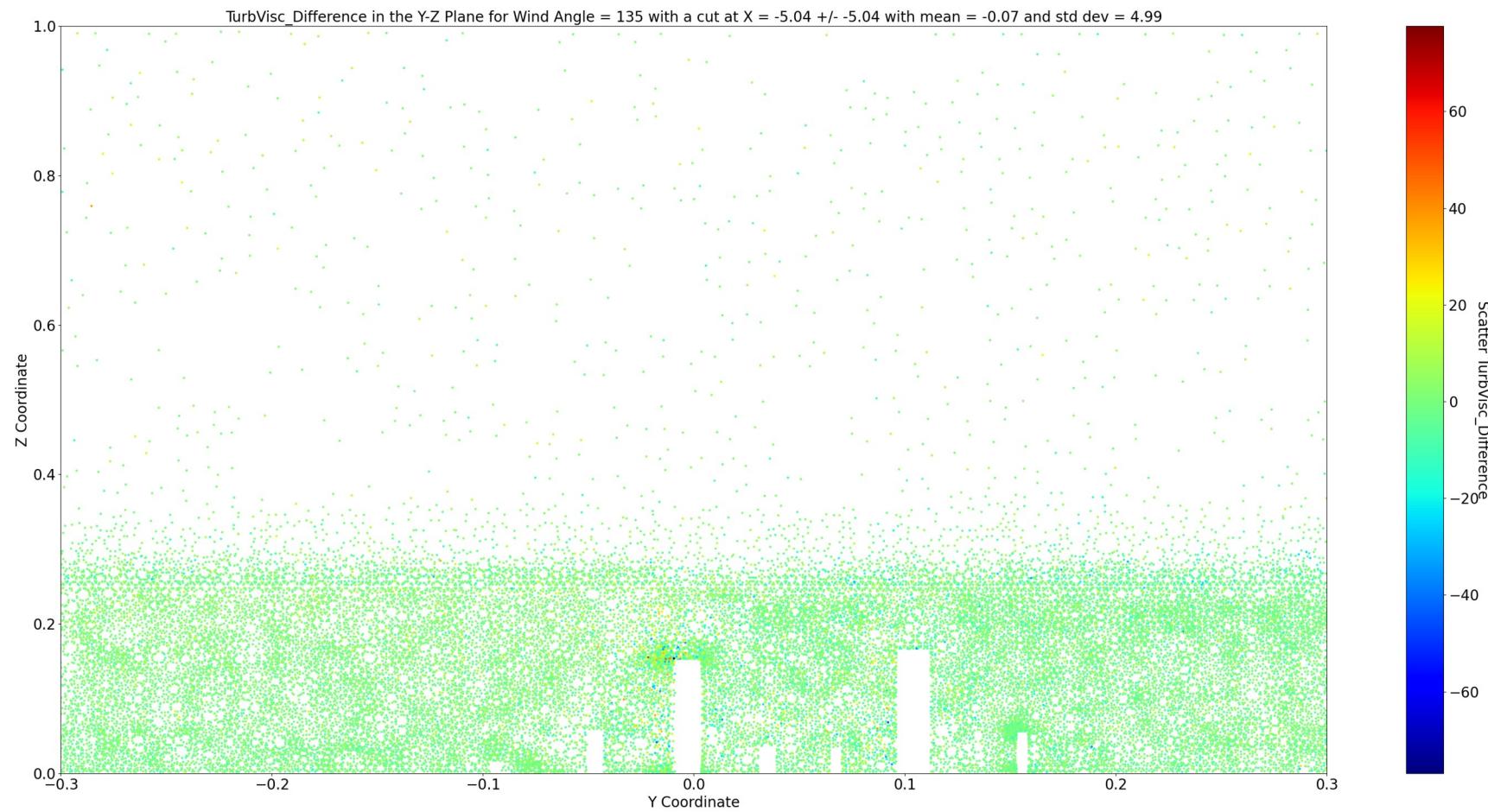
Predicted Velocity Magnitude in the Y-Z Plane for Wind Angle = 135 with a cut at X = -5.04 +/- -5.04
Mean = 3.49 and Standard Deviation = 1.48



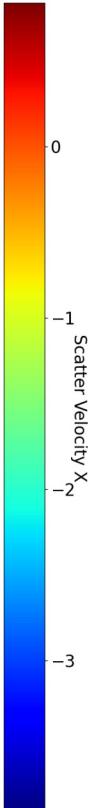
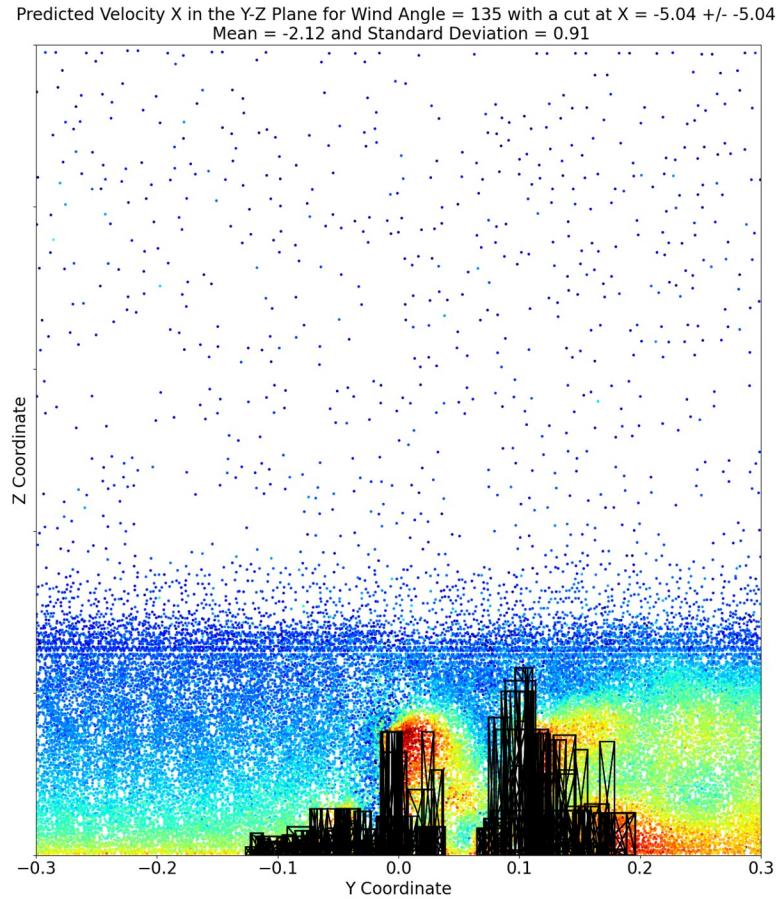
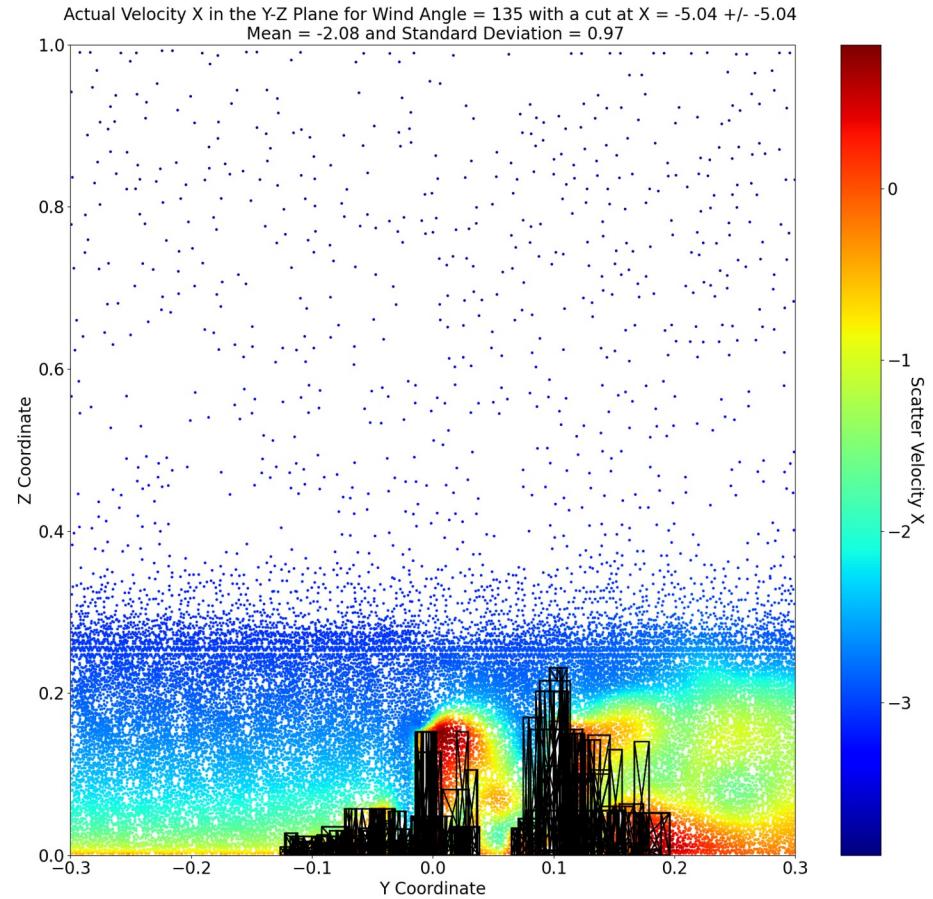


Comparison of Actual vs. Predicted values with Wind Angle = 135 in the Y-Z Plane with a cut at X = -5.04 +/- -5.04

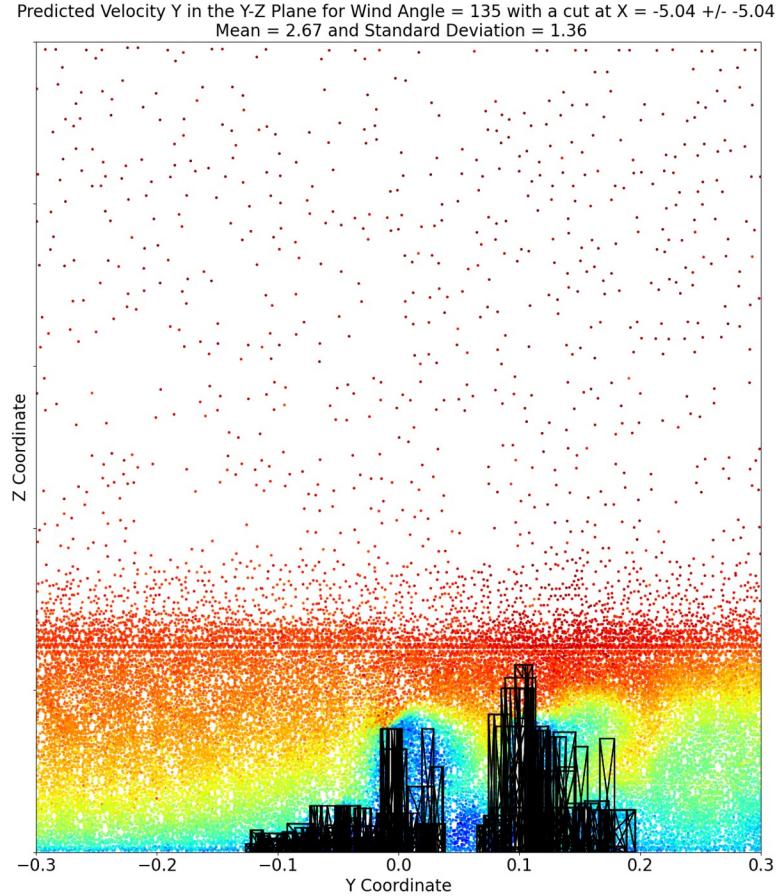
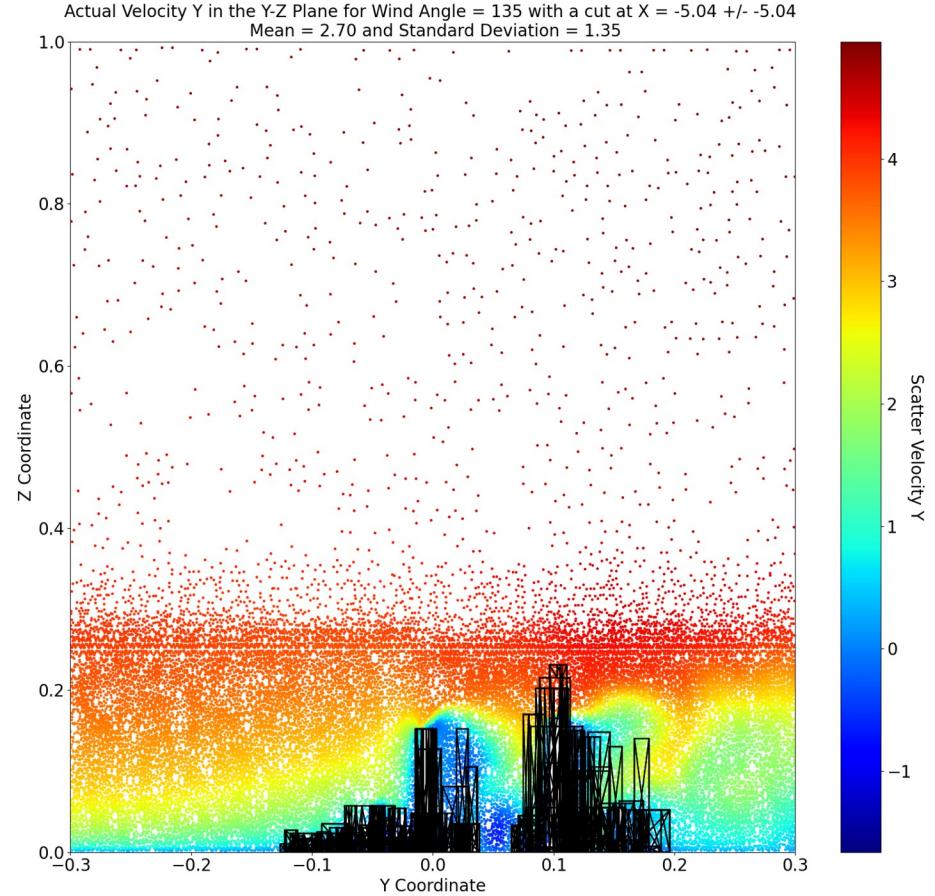


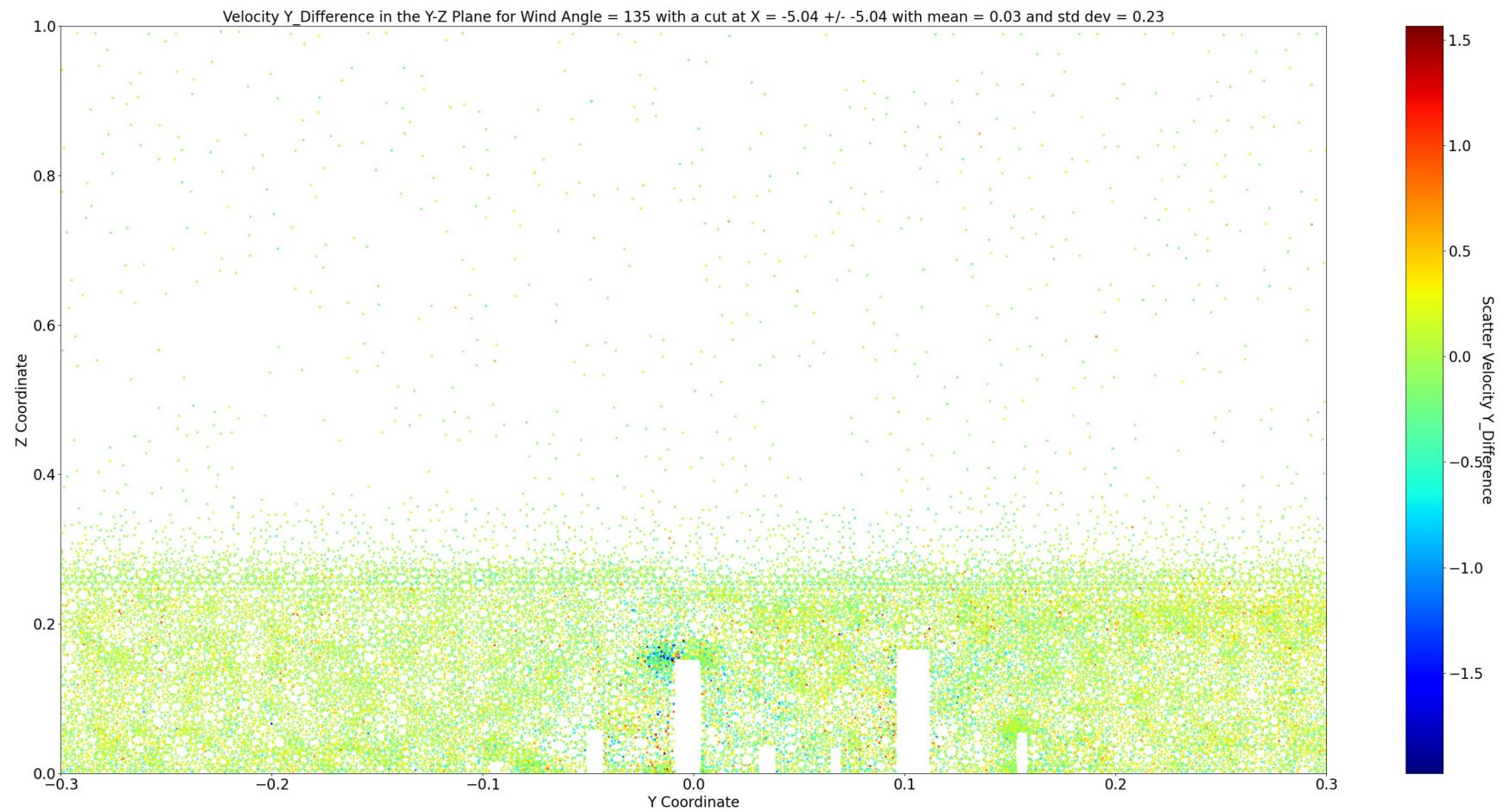


Comparison of Actual vs. Predicted values with Wind Angle = 135 in the Y-Z Plane with a cut at X = -5.04 +/- -5.04

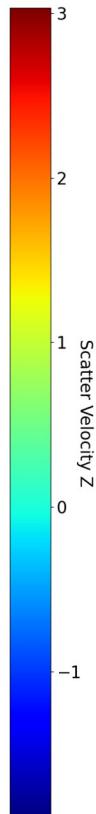
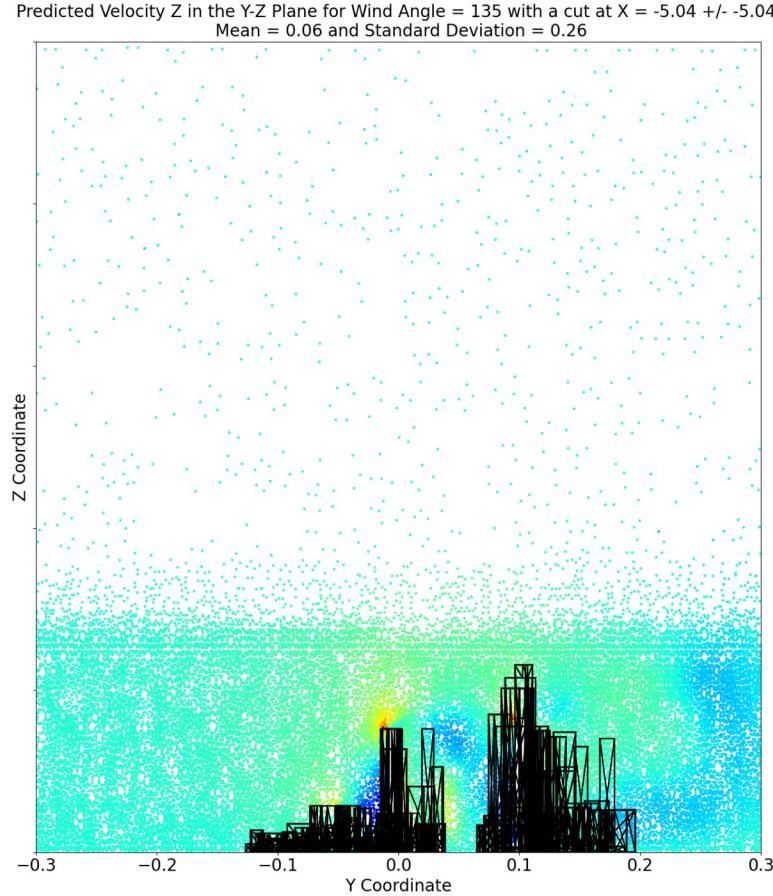
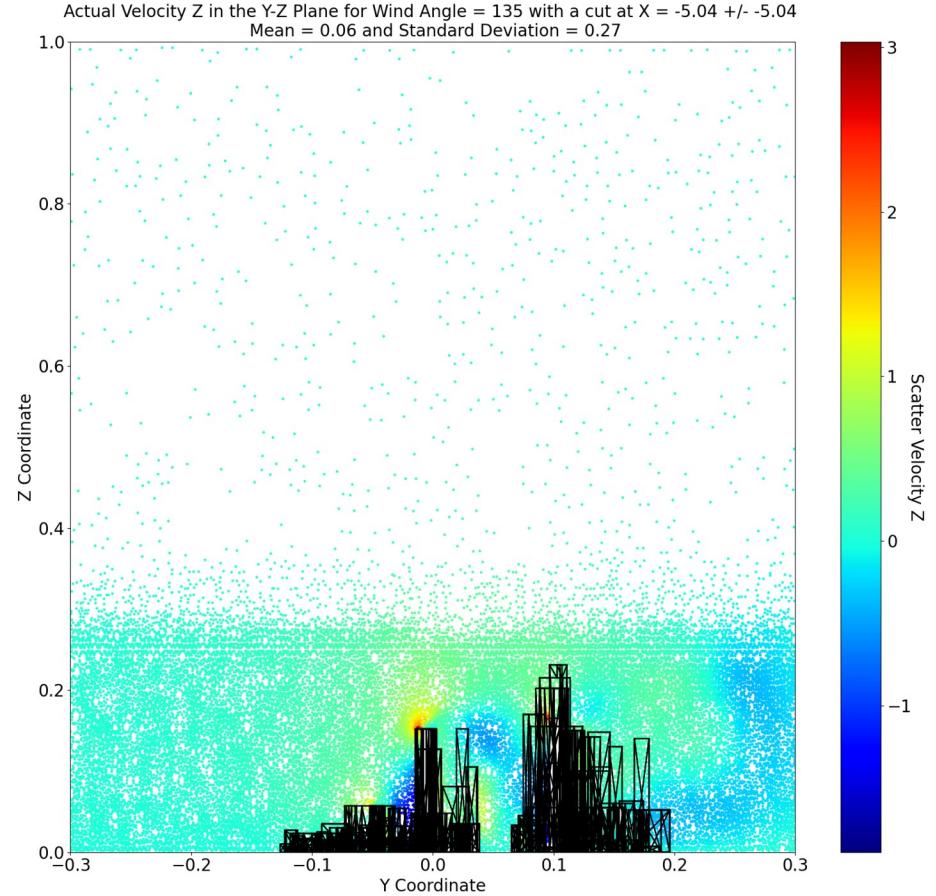


Comparison of Actual vs. Predicted values with Wind Angle = 135 in the Y-Z Plane with a cut at X = -5.04 +/- -5.04

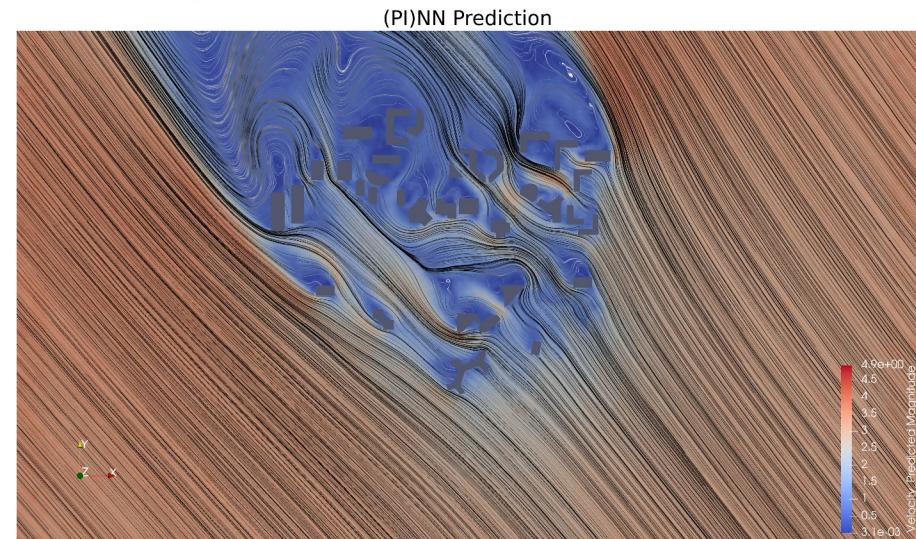
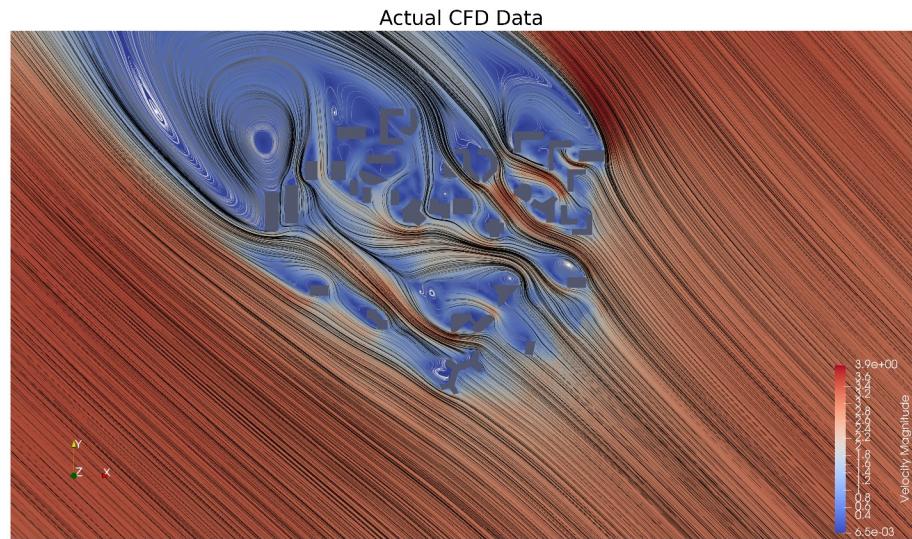




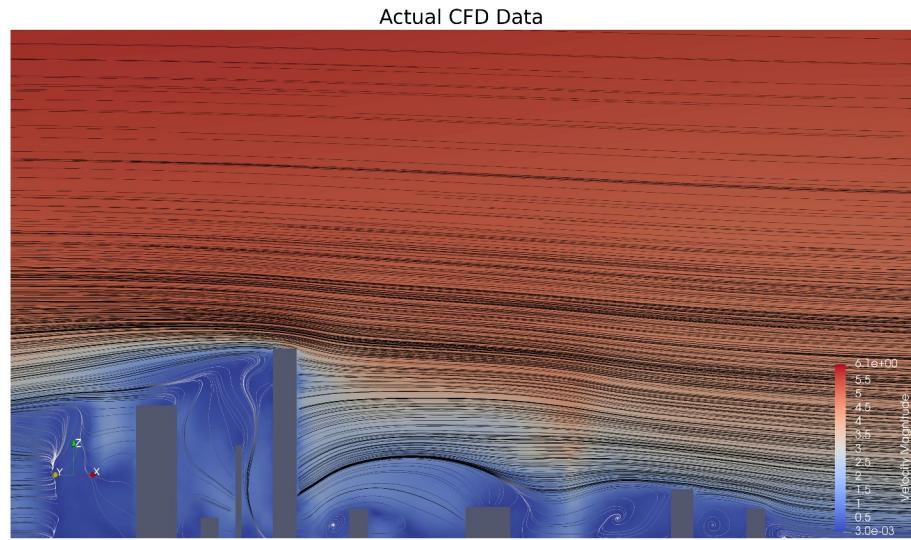
Comparison of Actual vs. Predicted values with Wind Angle = 135 in the Y-Z Plane with a cut at X = -5.04 +/- -5.04



Actual CFD Data vs (PI)NN Prediction for Wind Angle = 135



Actual CFD Data vs (PI)NN Prediction for Wind Angle = 135



(PI)NN Prediction

